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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES.

Exposure of Municipal Socialism.

THE case against Municipal Socialism which "The Times" has undertaken to present to the tribunal of public opinion has already become so formidable that little remains to be added to persuade Parliament to give the whole subject of the working of local government in the United Kingdom particular attention with a view to the introduction of needed reforms. If evidence were needed of the dismay thus produced among the fuglemen of the "Progressive" Party in municipal politics, it would be forthcoming in the feeble attempts of their favourite newspapers to disparage the evidences of Socialist jobbery, extravagance, and mismanagement of public resources now for the first time collected together and woven into a coherent narrative. These proofs are too voluminous for reproduction; but their gravity and point are increased by the protests rising on every side respecting the heavy and growing amount of local rates. Already the agitation against modern Municipal Progressivism has risen beyond the point at which the public uneasiness could be allayed by the re-appointment of the Joint Committee of both Houses of Parliament on Municipal Trading. This is only one branch of the general question. Until now, the movement represented by the appointment of this Committee was feeble, and not founded on considerations that appealed strongly to the general public of property-owners and ratepayers. Although supported for good reasons by many eminent and substantial men of affairs, it was discountenanced by others of equal weight in Parliament and the country; and it had the appearance of being aimed against a great body of accomplished facts which the strong friends of the large Provincial Municipalities felt it their duty to defend.

The question of Municipal Trading has now sunk into a relatively secondary place in the larger problem of how to reform the local government of the country on lines of reasonable economy and prudent husbandry of local resources. This enlargement of the agitation is due to the revelations that are being made of the wide-spread existence in local authorities of false and pernicious ideas, and consequent injustice and inequality of administration. A great parade has been made of the "purity" of British municipal bodies as compared with the state of corresponding institutions in some countries, or even with the unreformed corporations of the past in this country. The claim has been backed up by a considerable amount of very unsavoury, and not always single-minded, exposure and condemnation of asserted illicit dealings by trading members of town councils. Much of this noisy crusade in the asserted cause of municipal purity has been nothing better than a cover for the perpetration of other kinds of abuses. There is also in progress simultaneously an overt propaganda for advancing practical Socialism by means of the machinery of local government. Books are published, and periodicals circulated, to maintain that municipal government is the present hope of Democracy. In preparation for the advancement of this cause, the country is flooded with writings to the purport that everything done by, and in the name of, the municipality is wholly good, while private enterprise is wholly bad. The cure for all social ills is "Municipalization." It is a simple formula, and comes from a school of politics and a habit of mind which exalts formulæ and has no regard for the manner of their working.

What such formulæ as that so dear to the Progressive soul, that "the Municipality should be a model employer," mean in practice, is among the revelations of "The Times." It is not necessary for a local authority infected with this notion to be engaged in Municipal Trading, for it to make ducks and drakes of the ratepayers' money. West Ham and Battersea and the London County Council itself furnish examples in point; but there are many more. The test for the whole thing is the rates. Whether or not municipal bodies engage in so-called remunerative undertakings, the undeniable fact of the situation is that the rates as a rule continually increase, notwithstanding the equally general rule that rateable value is also rising. There is something radically wrong somewhere, and the growing popular belief is that it is everywhere. From the Local Government Board and the Board of Trade downward through the whole system, there is no real check upon the extravagance in capital and working expenses of elective bodies. Only to name one matter as an indication of the state of the whole, there is never any difficulty in the way of a Municipality committing the ratepayers to an electricity supply undertaking which can never be used by more than a handful of their number, though the first estimates of cost may be farcical. But, of course, this is not the worst of the matter. All these extravagances fall in the last resort upon the poor, who, when rents go up as a result of the increased cost of building and the rising rates, are put off the scent of the cause of all the mischief by abuse of ground landlords, and taught to cry for more Municipalization. So local politics get into a vicious circle, which can only be broken by some strong measure of reform from above, directed strictly to the facts and ignoring catchwords.

The Lesson of Chelmsford.

SUPPORTED by the presence and kind-heartedness of his Chairman (Mr. W. W. Duffield) and Directors, the President of the Eastern Counties Gas Managers' Association (Mr. E. W. Smith) was able to give the members who visited Chelmsford last Wednesday a very gratifying reception. The number of members in attendance was not quite so large perhaps as has been experienced at the last two meetings; but the explanation, we think, is to be found in the geographical position and the inconvenience of railway communication with the far parts of the Association district. If the figures given by Mr. J. H. Troughton (in acknowledging the handsome and well-deserved recognition which the members have made of his services on retiring from the secretaryship) are studied, it will found that, as a rule, the meetings held in towns which can only be reached by the Great Eastern Railway have never been attended by such numbers of members proper as those in towns more easily accessible. On this occasion, for instance, many of the members distantly situated from Chelmsford had to spend two nights from home in order to be present; and this is, in some cases, an impossible expenditure of time or money, or both. Of course, this drawback to attendance cannot well be avoided. Every part of the district must in turn be visited, and every part must in turn have its presidential representation, which, as a rule, carries with it the duty of doing honour to the President in his own town.

However, the good old-fashioned county town of Essex has a peculiar attraction for gas managers. It was one of the first among provincial towns to boast of a gas supply—the Company having been formed in 1819; and, in like manner, it took a foremost place—if not the actual lead—among country towns in having electric light for the illumination of the streets. In those days incandescent gas lighting was not what it is now; and the Gas Company had to meet the competition under disadvantageous circumstances. At first, they felt the loss of the public lighting acutely. But it was not long before the people of Chelmsford were filled with doubt as to whether they had acted wisely in giving over their streets to the new vagarious illuminant, and many of the townsmen, after the years that have flown, are still unsettled in opinion on this very point. Meanwhile, under the energetic management of the former Engineer, Mr. E. G. Smithard, and now for some years of Mr. Smith, the business of the Gas Company has increased considerably—so much so, in fact, that the President tells us in his Inaugural Address that it has been deemed necessary during the present summer to enlarge the storage capacity. The satisfaction of the Board, too, is reflected in the words of the venerable Chairman, when welcoming the members of the Association. Mentioning that there was no town in

England where there had been greater competition with gas than in Chelmsford—one of the great electrical supply companies having their headquarters there—he said: "I am "glad to be able to tell the gas engineers before me, in case "any of you may be threatened with the same competition "elsewhere, that if you are as successful in combating "electricity as we have been in Chelmsford, you will have "nothing to regret." How this success has been obtained under the very noses of a leading firm of electrical engineers, no direct information is given; but it is not necessary to seek far for it.

A gas engineer's and manager's training never ceases till the day that he retires from office; and to the President and Mr. Smithard, his predecessor at Chelmsford, the competition in that town has been a splendid education in militant gas management. Therefore (although Mr. Smith, in his address deals with very many matters which evince a studious interest in all current gas questions, and an ability to grasp and adequately appraise the value of the signs of the times), there is no part of his deliverance that has greater attraction for us than that in which he deals with the qualifications of the gas manager of the future. There we have the essence of his own practical experience of the past few years in the task of meeting strenuous competition in a restricted field. To his mind, the average gas manager has in the past neglected greatly the commercial side of gas-works management; and who can gainsay the truth of this before torpidity was electrified into activity? In some cases the neglect continues, and will be until electricity comes, or an energetic spirit is ingrafted into the direction, to clear the dust-clogged wheels of the lumbering concerns. However, the training of a gas engineer and manager, Mr. Smith says, is not complete by his being thoroughly versed in all the modern methods of gas production and distribution, by being competent in structural engineering, and by being technical in all branches of the business to his finger tips. But, combined with these qualifications (to make the business under his charge thoroughly sound and successful), must be a close knowledge of all business affairs, and a capability of exercising that knowledge. There we have the lesson which the ardent competition the Chelmsford Gas Company have had to meet has taught their managers. They, among others, have learnt the importance of "pushfulness;" and if Mr. Smith had devoted himself to this topic and no other, his address would still have been accounted by us as valuable among the presidential utterances of the day.

In addition to the address, there was a paper by Mr. J. W. Russell Wall on the "Rapid" charging and drawing apparatus. It is to be regretted that no notice was given of this contribution to the proceedings, and that the invitation to the author to read a communication on the subject was not issued earlier. As it was, members were totally unprepared to discuss the subject, and the author had not time to provide necessary explanatory drawings. Both the paper and the apparatus suffered in consequence—the criticism being altogether one-sided. But as a set-off against this criticism, practical experience cannot be ignored. The other parts of the proceedings need no special mention; but the report will be found to contain much that will interest.

State of the Labour Market.

Last week we published and endorsed an appeal to employers on behalf of those artizans who, after leaving their employment in Britain to fight for her in South Africa, have been, or will shortly be, released from military service, and are once more in need of peaceful occupation. Consideration of the Board of Trade report as to the state of the labour market in August affords cause for fear that the task of finding work for all these time-expired men will prove one of considerable difficulty—a fear that should strengthen the determination of gas-works managers to do their utmost in the way of solving the problem by, as far as possible, giving preference to the returned reservists when taking on their winter hands. The figures as published by the Board of Trade show that the percentage of unemployed members of Trade Unions last month was higher, not only than the corresponding figures for last year, but also than the mean percentage for the ten years 1892-1901. The exact figures are: August, 1902, 4·5 per cent.; July, 1902, 4 per cent.; August, 1901, 3·9 per cent.; mean for ten years, 4·4 per cent. The only trades showing good returns were the coal-mining, iron-mining, iron-making and tin-plate industries, which have been favourably affected by the state of trade in the United States. In the engineering and metal trades, the shipbuilding, leather, paper, and building industries, employment has declined; the falling off in regard to shipbuilding (which is likely to become more pronounced) being especially noticeable. Trade, in so far as it is concerned with the home demand, is not in fact improving; while the "boom" that was by some anticipated as a sequel to the proclamation of peace in South Africa is at present only conspicuous by its absence. All this spells harder times for the fringe of the working classes; and before long we shall have our old friend, the problem of the unemployed, looming large in the newspapers, and the demand for State-made work will be heard in Hyde Park and in Trafalgar Square. That is the time when the kind-hearted man who understands political economy, and has seen the results of its disregard in the Colonies, has to be careful not to let his heart over-rule his head.

Labour Difficulties in Wales and Other Coalfields.

The leaders of the miners in the South Wales coalfields have of late considerably modified the tone of their speeches in reference to the negotiations that are pending concerning what system of adjusting wages is to be adopted at the end of the year, when the sliding-scale agreement expires. They appear extremely anxious to impress upon the public that, if a stoppage of work should take place, it will not be the fault of the men or of their leaders. This they have taken every occasion recently to repeat; "Mabon" being particularly emphatic in his declarations that, if a stoppage occurs, it will be a lock-out, not a strike, and the Vice-President of the Federation has followed his lead. Considering that it was the men who gave the notice whereby the existing agreement will expire, and that but for this notice no crisis whatever would have arisen, this new-born zeal for peace on the part of the Union officials strikes one as altogether too transparent an attempt to mislead the public—as thin an artifice as that whereby it was sought to relieve the Federation of responsibility for the "stop-day" policy—and if a stoppage of work should ensue, we do not think that many people who are informed of the facts will hesitate in putting the responsibility on the shoulders of the Union. We say "who are informed of the facts," advisedly; for it goes without saying that certain of the newspapers that are supposed to "inform" the public daily will take the side of the men whatever be the merits of their case.

Judging alone from the public utterances of the Union leaders, we should have said that the firm attitude of the employers was causing them some uneasiness, that they foresaw that the upshot of the negotiations would be for them a climb-down or a fight, and that they were by no means sure of public support in the latter contingency, and were doing their utmost to secure it by loud-mouthed but insincere assurances of their desire for peace. We must, however, put it on record—and we do so with pleasure—that a student of the situation who ought to be able to gauge the real state of affairs more accurately than an outside observer—we refer to the Special Correspondent of the "Colliery Guardian" in South Wales—takes a more hopeful view of the future. He declares that the different tone that has characterized the recent utterances of "Mabon" and his colleagues is due to "reasons into which it would "not be prudent to enter at this juncture," but which led him to assert, "upon the best authority," that, unless the situation be changed in a very material degree before the end of the year, such a catastrophe to the coal trade as a prolonged stoppage will be avoided. He again emphasizes this hopeful anticipation, at the end of a discussion of the situation which it opens by "venturing to assert that, upon "this occasion, South Wales will not again be the scene of "a struggle" such as that which, in 1898, was accompanied by so much loss and suffering.

We would gladly accept this view without reserve if we could; and its assertion certainly makes one feel that there are some grounds for anticipating a comparatively peaceful issue. But there is one factor in the situation that must not be overlooked, and which obliges us to "query" the unqualified optimism of the correspondent quoted above. That is the connection of the South Wales Federation with the Miners' Federation of Great Britain, whose aversion to the sliding-scale, and whose desire to control wages throughout the coalfields of Great Britain, are notorious.

The coalowners of South Wales will not, we believe, consent to the arrangement of the rates of wages payable at their collieries passing from the hands of those directly concerned into the grip of Mr. Pickard, simply to satisfy the megalomania of that gentleman and his colleagues. Recent events in the "Federation" coalfields have not been of a character to make any employer anxious that his workmen should be under the sway of that Union. It remains to be seen what measure of liberty the leaders of the men in South Wales will be allowed by the larger Federation (upon whose help the Welshmen must rely, if it comes to a struggle), and whether this liberty will allow them to modify their present absurd proposals sufficiently to make them acceptable to the employers.

In regard to labour difficulties in other coalfields, it may be noted that the trouble with the "lads" in Yorkshire and Derbyshire over the 10 per cent. reduction awarded by Lord James is slowly quieting down, after causing much loss and inconvenience, and a considerable restriction of output; that the prolonged strike at the Denaby and Cadeby collieries, which also involves a material reduction in the output of Yorkshire, still drags on; and that wages in Scotland have now been reduced to the minimum of 37½ per cent. above standard. In America, the anthracite miners' strike is not yet settled, and is producing scenes of riot and bloodshed. The real question at issue is the demand of the Union for "recognition." One result of it is that coal is beginning to flow from Wales to the States—a reversal of the situation of two years ago.

The Position of the Large Gas-Engine.

It is quite right and fitting that the great development in size of the internal combustion prime mover—shortly, the large gas-engine—should have been brought before the British Association this year; and Mr. Herbert A. Humphrey, well known in connection with Mond gas, was the proper person to do it. In another column, we give an abstract of Mr. Humphrey's communication, which is of value as placing the facts of this remarkable development upon indisputable record. As the author justly remarked, the statement which he was able to make in this regard has few parallels, if any, in the history of engineering enterprise. In its general aspect, it illustrates once more the truth that has been so often dwelt upon in connection with modern advances in mechanical engineering, of the quickness and comparative ease with which things deemed to be worth doing at all can be accomplished nowadays, in comparison with the painful experiences of those old inventors and innovators, from Murdoch and Watt onwards, who were "before their time." That is to say, these pioneers usually encountered enormous and sometimes insuperable difficulties in the way of the realization of their designs, from sheer lack of the means, materials, and tools necessary to carry them out. All this has been changed; and though designers with large ideas may still need to improve accessories before they can perfect their ulterior dispositions, the time required to effect this has been enormously abbreviated, and the boundaries of the physically impossible have been widely set back on all sides. As regards the large gas-engine, the classification of which may be understood to begin where the practice of makers of these motors up to the close of the last century ended, the rapidity of the advance is as remarkable as its complete mechanical success. Writing in 1897, Mr. Dugald Clerk could state, in his book on "The Gas-Engine," that "at "present, the largest gas-engines do not indicate more than "40-horse power, and very few are in use so powerful." Within five years, Mr. Humphrey can assert, with equal truth, that gas-engines of 1200 and 1500 horse power are already working, and others of from 2000 to 4000 horse power are in course of construction. To what, then, it may be pertinently inquired, is this tremendous enlargement of the gas-engine attributable?

It would require too much space to adequately answer this question here. We are not sure, indeed, that a simple and comprehensive explanation of the advance has ever been formulated, but will hazard the tentative, and doubtless very imperfect, suggestion, that it has depended upon at least two conditions. The first is that a use for the large gas-engine should be found, which was immediately forthcoming in the driving of air-blowers for blast-furnaces. The second is the availability of an ample supply of very cheap gas of low calorific power, which was found in the waste gaseous product of the blast-furnace itself, and also in the washed gases of common coal gasifying "producers" of the Mond, the Duff, or the Wilson type. The small calorific power of these gases proved to be an unsuspected advantage for this particular application. Their only drawback has proved to be their dusty impurity; for the tarry impurity is removed by the preliminary processes to which they are subjected for the recovery of their bye-products. Still, there are other considerations recognized by Professor Capper in the case of the proposed gas-power electricity generating plant for Dumfries (also mentioned in another column), which quite agree with Mr. Dugald Clerk's views of 1897 on the point of the comparison of gas with steam power. In this connection, it is interesting to note that the Corporation of Glasgow have under consideration a suggestion to instal gas-engines as auxiliary, or stand-by, motors for their electricity generating stations, which will result in fresh light being thrown upon a problem of absorbing interest at the present time.

A Novel Project for Sunderland.

It is a rather remarkable coincidence that, immediately after what has transpired concerning the inability of the Manchester Corporation to provide cheap electric power in their area, the Sunderland Corporation should let it be known that they are willing to undertake such a supply for the benefit of the shipbuilders and engineers of their district. The subject is dealt with in our "Electric Lighting Memo-"randa" this week; but we mention it here, because it might almost be regarded as an answer to our criticism of the idea that electric power can be materially cheapened by being provided on a large scale. As a matter of fact, however, there is no contradiction of our views in this Sunderland project; but rather is it to be regarded as a striking compliment to the enterprise of the Walker and Wallsend Gas Company, who have the only electric power business in the country that is worth the doing. The data should never be lost sight of in criticisms of these power schemes; and the first truth of all is that every project of the kind must be judged upon its merits. Tyneside has gone in for electric power; and Sunderland feels constrained to follow suit. It is instructive to learn that the Sunderland Corporation are advised that it will be possible to supply electric power at from 1¼d. to 2⅜d. per unit, according to consumption. If anything like a trade is done in the new branch, the customers will necessarily be big works paying at the lowest rate. The question here is, Will the undertaking pay? In itself, probably not. It costs the Sunderland Corporation at present about 2½d. per unit to make their low-pressure electricity. The price of gas in the district—supplied by a Company, be it noticed—is admittedly very low. It averages well under 2s. per 1000 cubic feet; the lowest price being 1s. 6d. for large consumptions. Thus the Corporation are unable to go ahead very fast with their electric light. So far as the supply of power from their existing plant is concerned, they cannot touch the cost of power generated by gas-engines. The situation which will be created if the Corporation obtain sanction for their new venture is therefore unprecedented. It will be instructive to mark what sort of case the Corporation will make out to satisfy the Board of Trade. They can only plead that the situation of Sunderland is peculiar, and that it is incumbent upon them to help the local industries of shipbuilders and engine-builders by supplying them with electric power at cost price or under. Gas power probably will not meet the case, or the Gas Company might certainly have something to say. It may possibly be considered the right thing for the Corporation to assist the principal local manufacturing industries in the manner they propose, just as the Manchester Corporation stepped in to help the Ship Canal. Let it be clearly understood, however, that this is the true parallel of the project. The Walker and Wallsend example is a private venture exclusively. If it were to fail, nobody but the proprietors would be losers. We have not heard what the Sunderland Gas Company think of the new enterprise of the Corporation, but would remind the Directors that they are custodians of the interest of large ratepayers, and that their compeers elsewhere have found it expedient to take certain defensive measures.

State of the Petroleum Market.

There have been many rumours of late concerning the fortunes of different oil companies. We are quite unable to form an opinion as to what may be the probable outcome of

all the reconstructions and working agreements of which the financial newspapers have been full—all, it may be assumed without much risk of error, aiming at keeping up the price of petroleum. There is one announcement, however, made in a recent issue of the "Petroleum Review" which appears to carry a definite message to all who are concerned in this matter of oil prices. The statement runs as follows: "The "Associated Oil Company, which contributed to the decline "in the price of oil, by underbidding companies not in the "combination, when contracts for furnishing oil were to be "let, has suddenly changed its tactics, and orders have been "issued from New York to reduce production. This is a "move of the Standard Oil Company, and it should prove "to be of benefit to all oil producers." It is not stated where the purchaser is to come in; but this is the peculiar beauty of these large combinations. Large as is the world's oil production, and various as are the sources, they are but a trickle down the mountain side in comparison with the bulk of the coal output; and it passes the wit of man to know what any particular grade of oil is really worth at any time. There appear to be so many financial wheels within wheels in this business, that a steam-turbine is too simple a machine to serve as a metaphor in this connection. Speaking of petroleum, we are reminded that the Stores Department of the London County Council have weakened over the pedantry of the main body, which ordered them to buy for the service of the Council only oil with a flash-point of 105° Fahr. This requirement has been in force for some years; and now the official buyers of this luxury in the way of burning oil have had enough of it. They report that if they were allowed to buy oil of 100° flash-point, the market against them would be much easier, while the oil would be just as safe; and they accordingly ask for this measure of relief. Moreover, the Council are reminded that it looks rather unreasonable for them to insist upon 105° flash oil, while willing to recommend Parliament to permit the community to purchase oil of 100° flash. As if logic ever had anything to do with the decisions of the London County Council! By and by, perhaps, the Council will learn other truths about petroleum and the trade in this interesting commodity, which is unquestionably better for being left as unfettered as may be by artificial restrictions.

Amalgamation Prospects.

It is a little early to write definitely of what is happening in connection with the proposed and long-hoped for unification of the Gas Institute and the Institution of Gas Engineers; but, if credence may be given to rumours, those who are behind the scenes are persuaded that, so far as can be seen, there is nothing now in the way of the first annual meeting of the new and united organization being held next year. We hope this may be so. This there is good authority for saying, that within the next fortnight a report of the proceedings of the Joint Councils under the authorization received by them from the members at the last annual meetings will be circulated; and thereafter there seems to be no reason why the present year should end without the fulfilment of all the preliminaries necessary to the accomplishment of the ultimate object.

Church Lighting.

The gas manager with an eye to business might do many things worse than turn his attention to the question of the lighting of places of worship, in which for the most part the evening congregations still sit in darkness. A little of the practical wisdom of gas managers rightly directed would relieve such congregations of the depressing influence of the conditions under which they worship during the evening services in winter, and would at the same time serve as a telling advertisement of what gas can be made to do—and in assemblies representing a large number of the homes in the neighbourhood. Ordinary folk know nothing about photometrical tests and candle power; but they do know, when a change for the better is made in lighting, that whereas they had some difficulty to see the tiny print of their Bibles, hymn books, and prayer books under the poor flat-flame jets that did duty perhaps before they were born, under the new conditions they can follow the printed words with comfort and ease, and they experience a delight, the effect of which will be carried beyond the church doors. Furthermore, the gas manager can, by the aid of the incandescent gas-light, while beautifying the churches and chapels of his district, save them expense, which some of these places sorely need and would welcome. One difficulty in the way of the gas manager is to convince the church and chapel authorities that he can help them; but after reading a little article which Mr. J. H. Troughton, of Newmarket, has contributed to this week's "JOURNAL" on the subject (p. 810), there should be no difficulty in this respect. In an article, too, which precedes it on incandescent lighting in Wellington (N.Z.) will be found two illustrations of decorative lighting carried out in churches in that city. Mr. Troughton gives particulars on all points—as to the improvement effected by incandescent burners in the lighting of Newmarket churches, cost of installation, saving to the churches in gas consumption and money, and a summary of other advantages. He has set out his notes in such a crisp manner that we need not repeat their salient features here. If, however, it will be of any assistance to gas managers in placing the information before church authorities in their districts—providing there is a sufficient demand—we will obtain Mr. Troughton's permission to reprint the article.

Halifax Gas-Works Investigations.

While the question of the investigations in connection with the Halifax Corporation Gas-Works is still as it were *sub judice*, propriety restrains comment on the summaries of the reports which are reproduced in our news columns from the "Halifax Courier;" but, fully recognizing the gravity of the matter so far as the Engineer (Mr. Thomas Holgate) is concerned, we think it would only be doing him common justice to agree to the suggestion contained in the final paragraph of his "observations" on the Sub-Committee's report—if the Gas Committee still entertain any doubt that the money spent on the gas-works has been wisely laid out. His proposal is that one out of a list of five eminent engineers to be named should be asked to investigate the design, execution, and cost of the works; and if his (Mr. Holgate's) share of the work is not vindicated by the gentleman the Committee select from the list, he will not say a word. But, on the other hand, if the award declares him to be entitled to some payment, he hopes the Committee will agree to it beforehand. From what we know of Mr. G. H. Wadsworth, the Chairman of the Gas Committee, and his colleagues, they will not allow the suggestion to pass unheeded, if, in their opinion, an injustice would result. The present position of affairs at Halifax is certainly one that requires independent expert investigation, which would be free from any local prejudice or feeling that might tend to warp judgment.

Hartley's Manuals Revised and Enlarged.

The important new work by Mr. Jacques Abady, of which the first portion of a critical notice appears in another column to-day (p. 806), well deserves the attention of readers of the "JOURNAL," as it is many years since so exhaustive a treatise on gas testing and gas measurement has been published. It is based on the late Mr. F. W. Hartley's "Gas Analyst's Manual" and "Gas Measurement," but is far more comprehensive than these two little books, well thumbed copies of which are still retained in the handiest position in every gas-works library. Mr. Abady has evidently done all in his power to produce a work which shall attain an equal vogue. Much has happened to alter the conditions of gas testing since Mr. Hartley's books appeared; and the writer of the review of Mr. Abady's book has evidently at the outset been so much impressed with the evil influence on the gas industry of the growth and elaboration of gas testing as conducted by official examiners (of which the book contains so complete a record) that he may be charged with neglecting to indicate the intrinsic merits of Mr. Abady's effort. The phase of the question to which he more particularly refers this week is, however, of such immense significance to gas undertakings that he may be excused for having taken up his parable when he might more appropriately have enlarged on the good points of the book before him, on which, however, his animadversions cast not the slightest reflection.

Inclined Retorts in France.

It has always been somewhat curious that France, the modern cradle, if one may say so, of inclined retorts, should have been so backward in adopting this economical system of

carbonization. There are not wanting signs, however, that now that the original patent has expired, this reproach is going to be removed. We give in another column a translation of a paper by M. Godinet, of Lyons, which he read at the last meeting of the Société Technique du Gaz, and in which he describes in some detail an installation of six arches put up at the Vaise Gas-Works. We only refer to it here for two reasons. The first is that the plant described forms, as it were, a kind of preface to the new history we believe to be in making in France with inclined retorts. In the paper, mention is made of another, and more important, plant being erected at new works for the Lyons Gas Company; and we also hear of a still larger inclined retort-house and bench being erected near Paris. Our second reason for making this reference is that we find M. Godinet's paper instructive on the still-discussed question of the best length for an inclined retort. The retorts at Vaise are only 11 ft. 6 in. long, though this is for local reasons only, as the author shows that he has no prejudices on the subject by saying that "it is important to have the retorts as long as possible within practical limits," so as to reduce radiation and economize fuel, labour, and capital. The length of the retorts for the Lyons new works is 15 ft. 11 in.; while for the third installation we have mentioned the inclined retorts will be 20 ft. long—the first of that length in France. We thus seem to have here a regular development toward the accepted English length, from which, no doubt, our Continental friends will draw their own deductions. Even though labouring under serious disadvantages, we note that the Vaise plant has effected an economy of 50 per cent. in retort-house costs. We can thus congratulate M. Godinet on the success which has attended his first efforts in the fresh developments of inclined retorts in France.

Incandescent Lighting Achievement in Wellington, N.Z.

To a chance conversation in May last with a visitor from the Antipodes, we are indebted, in the first place, for the interesting and suggestive "Communicated Article" which forms a bright feature of this week's issue. Casually, in referring to incandescent gas-lighting matters, it was mentioned that the Wellington, N.Z., Gas Company were exceedingly resourceful in, and successful with, their methods of employing incandescent gas lighting to compete with a vigorously worked electric light supply. We lost no time in inviting Mr. R. G. Howell, the Secretary of the Company, to furnish us with some notes as to what they were doing in this respect; and we are greatly obliged to that gentleman for his prompt acquiescence, and the trouble he has gone to in obtaining photographs and drawings to illustrate and elucidate some of the most valuable parts of his communication. In tendering our thanks to the author, we are certain that readers will agree the acknowledgment is richly deserved. The article is full of useful suggestion; and it may be said here that gas managers at home are as pleased to receive hints and information as to experience from the uttermost parts of the earth, as those engaged in the direction of gas undertakings in distant parts are, we know, glad to avail themselves of new ideas from the homeland. Now, in this article by Mr. Howell, there are at least two distinctly new things—the system that obtains in Wellington of cleaning incandescent burners (which will be novel to most of our readers), and the ingenious method of lighting elevated incandescent gas-burners designed by the chief officer of the Company's fittings department (Mr. C. B. Norwood). It would have been a pity if these ideas had continued hidden away in remote New Zealand, and their benefit confined to the Wellington Company and such other undertakings as might have accidentally heard of them. We hope the hint will be taken by friends in far-away places. New ideas, methods, and inventions are of universal growth, and not indigenous to one or more countries; and therefore a description of anything that may be of service at home coming to us from across the seas will be as heartily welcomed to our columns as the news with which we are favoured from near at hand.

Maintenance Extraordinary and Elevated Lighting.

In the section of the article in which Mr. Howell describes the Company's system of maintaining incandescent burners will be found some information that will cause no little astonishment to many gas managers on this side—particularly to those who will not adopt the system of maintaining incandescent burners because they fear the income will not exactly tally with the cost, ignoring altogether the value to their undertakings of ensuring satisfaction on the part of the consumers. It would be interesting to hear their criticism of a system which keeps a staff of inspectors periodically visiting the houses of incandescent burner users, which provides for the thorough cleaning and repairing of the burners, and which only calls upon the consumer to pay the cost of the renewals. The cleaning of the burners is not performed in any perfunctory manner, nor left to the individual ideas of the inspectors as to the amount of attention they require. There is a settled process through which every dirty burner has to pass. Each inspector is provided before he starts his round with a certain number of clean burner tops; and, in the houses of the consumers, he replaces the dirty tops with clean ones. The former are taken to the works, where they are submitted to a severe ablution, then carefully examined, and, if required, fitted with new gauzes and clay rings, and are turned out to all intents and purposes as good as new. This, so far as our knowledge goes, exceeds anything that is done in this country. The article fully describes the cleansing process and appliances. The proof of the success of this thorough system of maintenance is the firm hold the Company have got over their consumers, and their 13 per cent. increase in business, in spite of the strenuous rivalry of the electric light. Of equal interest will be found the automatic system (devised by Mr. Norwood) of lighting high-placed incandescent lights. This is a clever piece of work; and the fact that its application in the Theatre Royal in Wellington resulted in the supplanting by the system of the electric lights in the Opera House is high testimony to its efficiency. The Company are to be complimented on their successful work, which is directed by capable officers and performed by a well organized and efficient staff. In his letter to us, Mr. Howell concludes with the hope that his "remarks and enclosures will be of interest." They are very much so to us; and we have no doubt regarding the views of our readers.

How Slander is Spread.

A correspondent calls attention to three paragraphs which have appeared at intervals in the "Star" newspaper, and which together complete and rectify as far as possible a piece of slander directed against the South Metropolitan Gas Company. The "Star" wandered out of its proper orbit, and quoted a defamatory tit-bit from the "East Anglian Times" (whose interest in the matter in question must be very remote), with the consequence that the London print has had to eat humble pie. The statement—which was headed "Gas and Dishonesty"—was to the effect that the Company had reduced the illuminating power of their gas in virtue of the powers obtained from Parliament, but had not complied with one of the conditions, that they should gratuitously supply the consumers with burners suitable for the lower candle power gas, and that they had so far treated all applications from the aggrieved consumers with silent contempt. The paragraph wound up with an intimation that, when Parliament reassembled, it was intended to "stir up the Company" to a sense of their duty. Nearly a week later, a short, insignificant-looking paragraph appeared, in which it was stated that Sir George Livesey had written to say that, far from the facts being as stated, hundreds of thousands of the improved burners had been supplied and fixed free to all consumers who had applied for them, and that in the previous week alone more than 4000 were fixed. Then it looks as though the meagre reparation the "Star" made for putting into circulation the libellous statement did not meet the views of the Company; for three days later, a longer paragraph was inserted, which the "Star" ended by saying "We beg to express our regret that we should have been misled into making a statement unfounded in fact and detrimental to the South Metropolitan Gas Company." It would be interesting to find out who set rolling such a fabrication as this. It can only have been maliciously inspired; and, whoever it was, he ought to receive his proper deserts. However, it is time the editorial staff of the "Star" exercised a little more prudence in the selection and publication of unauthorized statements. Perhaps this little incident will help them on to the path of discretion.

The Directors of the Kent Water-Works Company allotted, upon tenders, on the 17th inst., £80,000 of three per cent. debenture stock, redeemable in 25 years, at an average price of £95 5s. per £100—the lowest price accepted being £94 15s. Applications were received for three times the amount required.

ESSAYS AND REVIEWS.

EDUCATION QUESTIONS AT BELFAST.

The Importance of Theory.

THOSE of us who are keenly alive to the enormous importance to the future welfare of the nation of improved methods of education, and who are conscious of the dead-weight of indifference that must be moved before any practical and rational reform can be effected, must find no little ground for satisfaction in the prominence given to the country's needs and shortcomings in regard to education at this year's meeting of the British Association. In his Presidential Address, Professor Dewar devoted considerable space to emphasizing "the want of education among our so-called educated classes, and among the workmen upon whom they depend," which he declared to be the root of the evil which was discussed in the "JOURNAL" twelve months ago —namely, our hopeless inferiority to Germany in regard to the practical application of chemistry. The fundamental discoveries upon which the vast chemical industry has been built were made in this country; but the ultimate harvest has been left for the reaping of others, who possessed, as we did not and do not, "the diffused education, without which the ideas of men of genius cannot fructify beyond the limited scope of an individual." We have not been wanting in the "exceptional men"—Young, Davy, Faraday, Tyndall, Dewar; but that has not been sufficient, for industry is becoming every day more intimately bound up with, more dependent for success upon, science. As Professor Henry Armstrong (in his address, as President, to the section devoted to Educational Science) well put it, "so long as the forces of Nature were not tamed to the service of man, they could be neglected; sanitary sins were alone found out and punished with unsparing severity. But now it is otherwise. To succeed in competition with others, we must be able to avail ourselves of every opportunity, and wide understanding is demanded of us."

Professor Armstrong makes a much-needed plea on behalf of theory—a plea to which the leaders of industry (the heads of our great commercial and manufacturing undertakings) would do well not to turn a deaf ear. Theory is not in the best of repute among those practical men of affairs; but that is the fault, not of theory but of ill-taught theory. By this we mean, that students who have come to works from college in the past chock-a-block with "theory," taught to them by men whose knowledge was purely academic—derived from hand-books instead of from observation and practical experience—have so often proved (as they were calculated to prove, unless they were men of exceptional gifts which survived their education) egregious failures, that "education" and "theory" have been regarded rather with contempt by the man in the workshop. Our schools, says Professor Armstrong, have been paying no proper attention to "the development of imaginative power, or to giving training in the use of theory as the interpreter of facts," with the result that didactic and dogmatic teaching have been producing, as their inevitable product, sterility of intellect. The teachers know facts in plenty, but they have lacked training in the considered use of facts, and of theory founded upon the known facts. The blame rests, it will be observed, on our methods of education, not on theory. But it is "theory" which has become discredited in the eyes of many practical men; and Professor Armstrong's reminder, that "the term practical must not be understood as the antithesis of theoretical," is a timely one, and his illustration is happy: "Men such as Lord Roberts and Lord Kitchener . . . . are not merely practical soldiers of experience, but men gifted with powers of insight and imagination; men able to apply theory to practice."

"All that man does and brings to pass," said Carlyle, "is the vesture of a thought;" and what is wanted is, first of all, a recognition on the part of employers that students who are well versed in the "thoughts" (or the "theories") of the highest minds, in whose brains the ideas of men of genius can fructify, are of incalculable value in the successful carrying on of an industry—such, to take our own instance, as that of gas making—which is the outcome of the practical application of theory, and then so to modify our methods of education that the supply of such men shall be equal to the demand. But we want especially to emphasize the fact that the initiative of reform must come from the employers. As with profit-sharing and other schemes for reconciling capital and labour, so with any practical and successful plans for improving the quality of labour by reforming our educational system, the impulse must be provided from above, by those who are best able to perceive the need. It is no use for employers to sit still and wring their hands at the perversity of their workmen or the lack of skilled labour in all its branches. Salvation comes in these matters, as in higher, by faith and works—by seeing what is needed and setting about getting it.

This need for action on the part of employers is clearly stated in the third Presidential Address at Belfast, which concerned itself with education—that of Professor John Perry, read to the Engineering Section. Professor Perry also recognizes the difficulty of persuading the employer that better educated men are necessary—not only in the ranks and on the staff, but (as we have recently been emphasizing) among employers themselves. "We cannot," he says, "go on much longer, as we have done in the past, without engineering education; and, furthermore, it must be such as will commend itself to employers. It is certainly very difficult to convince an employer that a college man will not be a nuisance in the shops, whereas in Germany and France, and to a less extent, in America, there is among employers a belief in technical schools. If the true meaning of technical education were understood, it would commend itself to Englishmen." And then Professor Perry gives us an excellent definition of what technical education is, or rather should be. "Technical education is an education in the scientific and artistic principles which govern the ordinary operations in any industry. It is not a science, nor an art, nor the teaching of a handicraft. It is that without which a master is an unskilled master, a foreman an unskilled foreman, a workman an unskilled workman. . . . The cry for technical education is simply a protest against the existence of unskilled labour of all kinds." Then he adds: "To have any good general system, the employers must co-operate" —to which we would add, "and the employers must initiate." Let us hope that these Belfast addresses will help to make them realize their needs and their responsibilities.

ELECTRIC LIGHTING MEMORANDA.

An Electricity Supply Scheme for Dumfries—The Estimates—Professor Capper on Gas and Steam Power—The Sunderland Municipal Electric Power Scheme.

A PROPOSAL having been mooted for the supply of the town of Dumfries with electricity for lighting and tramways, the Corporation prudently referred the matter to an independent expert, in the person of Professor Capper, for his advice on the best means of carrying out the suggestion. This was precisely the correct course for the Corporation to take in the circumstances, and his report is now in the hands of the local authorities. We gather from this highly interesting and instructive document—abstracts from which will be found in another column—that the question of the expediency of the Town Council engaging in the proposed enterprise was not explicitly included in the terms of the reference to Professor Capper. Whether or not this was assumed beforehand does not appear; but, of course, Professor Capper could scarcely avoid dealing with the point in the course of his work. Accordingly he will be found to have stated that, in the case of a lighting undertaking alone, the Corporation might expect to pay working expenses, and interest on the cost, and put by about £420 to £450 a year for sinking fund, if they could get a lamp connection totalling 3000, with 360 street-lamps, charging 6d. per unit to private consumers and paying no more for the street lighting than the actual cost of gas. The capital outlay for a scheme of this magnitude is taken at £18,250. Naturally, if the volume of business secured were raised to 7000 lamps in circuit and earning money, the price of electricity could be dropped to 5d. per unit, and there would yet be a surplus of about £1150 to provide for depreciation and sinking fund.

The prospect is made out to be equally bright if tramway working is included; but this is a branch of the subject into which it is impossible for us to enter. Profitable tramway working is so entirely a question of the amount of traffic that, without reliable knowledge of this datum, criticism of any scheme must be mere guesswork. As regards electric lighting for Dumfries, however, criticism has plenty of material, contributed from all parts, to go upon. To begin with, it is a bold assumption of Professor Capper's that electric street lighting could be substituted for gas at Dumfries without any extra expense. Universal experience is mostly the other way. We cannot do the like in London, at any price. Local knowledge must decide whether Professor's Capper's minimum private demand for 3000 incandescent electric lamps is likely to be realized in Dumfries, and how long a period might be expected to elapse before this volume of business would be secured. It is a small affair after all, and there are not many comparable examples in respect to size to be picked out from published electric lighting statistics. Still, there are a few, and their finances are not of a particularly encouraging character. Before making the plunge recommended by their adviser, the Dumfries Corporation might ascertain whether it would be possible to lease the whole scheme upon terms such as would protect the ratepayers from risk of having to make good a loss. It will be too late to think about the ratepayer after the commitment is made.

Apart altogether from the question of the trustworthiness of Professor Capper's business estimates, upon which the matter of profit or loss depends, his report contains a most interesting discussion of the respective merits of steam and gas power for generating the electricity, which was one of the points specially referred to his judgment. There has been so much vague talk up and down the country concerning the wonderful advantages of "power gas," specially made by the Mond and other systems for driving engines, that it was quite natural for the good folks of Dumfries to inquire whether they might not expect to get some of these benefits in connection with their new venture. We therefore reproduce this part of Professor Capper's report in full,

and shall leave it to speak for itself, having no desire to criticize it in any particular. One can very readily sympathize, however, with the disappointed ones who will find in this statement of a responsible engineer referring to a special case, no support for the vague declarations upon which power gas schemes have engaged popular and parliamentary favour. Well may such inquirers ask what they are to think of "power" gas, if it is out of the question for the electric generation required at Dumfries? This, of course, is a question for engineers, who have answered it again and again. It cannot be gone into here.

A good deal of heart-searching is going on in electrical circles over the new departure in municipal trading indicated by the scheme actually in course of elaboration by the Sunderland Corporation for providing electric power for the use of the shipyards and factories on the river and in the town. It is felt that the local shipbuilding and engineering yards are on the brink of the adoption of electric driving, following the lead of their competitors on the Tyne; and it has occurred to the Electricity and Lighting Committee of the Corporation that the town might as well supply the power. In order to do this, it will be necessary to lay down fresh plant at an estimated cost of £74,000, to generate and distribute three-phase high-pressure current; and the Committee will have to be quick about it if they are to be in time. The Board of Trade have been sounded on the idea, and no official objection will be raised. The lighting current of the Corporation is low pressure; and it is intended that the new development shall be a distinct branch, though, of course, administered and managed in conjunction with the general electricity supply business of the Corporation. For some reason which is mysterious to us, the "Electrician" is greatly exercised in mind over this intelligence. In the current issue it pours much editorial scorn upon the suggestion that it is a legitimate business of local authorities to supply power for the driving of works and factories. It is admitted, indeed, that the "arguments in favour of this development are most plausible, once the principle of municipal trading is granted." But a solemn warning is given that there is no stopping place between the sale of electric power by a municipality and the municipalization of drapery or boot stores. We cannot follow this argument, with reference to its application to the case of Sunderland or any place similarly circumstanced. The supply of electric power has always been included in municipal electricity undertakings; and it was this fact which availed to keep the roving electric power-in-bulk adventurers out of the municipal preserves. True, nobody—whether municipality or company—supplying electricity in the ordinary way has yet succeeded in obtaining much trade in the matter of power, for a variety of reasons that need not be mentioned. But where a special local demand for power exists, as in the case of Sunderland, what is the new objection to the municipality, which already does all the other electric work, opening a fresh branch to supply it? There is no question of "principle" involved. To say that there is in this connection strikes us as being a waste of words. Municipal trading "on principle" has no friend in the "JOURNAL;" but this is not a case in point. It is a scheme to be judged entirely on the merits, and that is the very antithesis of a question of principle.

TRADE SITUATION IN THE UNITED STATES AND AT HOME.

THE very material influence that the condition of trade in the United States now has upon the markets of this country and the Continent, and must have in the future, renders it of importance that information concerning American commerce should as soon as possible reach the hands of those whose duty it is to watch the course of trade, and foresee if possible its trend. It is, therefore, gratifying to find the Foreign Office displaying an unusual promptitude in publishing the report of the British Commercial Agent (Mr. Bell) upon the trade of the United States for the year ending June 30. With this report, and the August returns of the Board of Trade, before us, we are able to make an examination of the very peculiar conditions at present holding in the markets, especially as regards the iron and steel trades, which may be called the corner-stone of British industries.

When, in 1900, the "boom" in this country was at its height, there were reasons to anticipate that the influx of iron and steel from the States, which the prices ruling here induced, and which had a material influence in terminating the "boom," was only a forerunner of a large volume of exports from America competing with British and Continental production. This was fully discussed in these columns at the time; and to the opinion then expressed we still hold as firmly as ever, that the competition of American manufacturers of iron and steel goods will prove, in a very short time—as time goes in the history of nations—a very formidable matter for the trade of this country. But for the moment, by a curious chance, the wheels are exactly reversed, owing to an extraordinary and prolonged outburst of activity in the home trade of America; and that activity is having a decidedly strengthening effect upon the iron and steel market on this side of the Atlantic. If the "boom" in America had synchronized with that in this country, the position would indeed have been a strained one. The present situation in the States may be gathered from the following facts, compiled from Mr. Bell's report—which, we may remark, would be easier to follow if the stupid plan had not been adopted of giving the particulars of some kinds of iron and steel in tons and of others in pounds, necessitating a considerable number of calculations before they can be reduced to a common basis.

Trade generally in the United States, says Mr. Bell, has continued to show such extraordinary briskness that in some articles the supply has fallen short of the demand. This is particularly the case with iron and steel manufactures. Notwithstanding the enormous output from the American furnaces, assisted by exceptional advantages as regards raw material, transport, &c., it has been found necessary to import considerable quantities of raw, semi-manufactured, and even manufactured material in order to assist in supplying the demand. In spite of this unlooked-for circumstance, and a great falling-off in exports, contracts have fallen very much in arrear, and many contractors have been obliged to suspend work altogether for want of material. The following statement shows the change in the course of the foreign trade of the States in iron and steel goods, other than machinery, hardware, and engines.

		Year ended June 30. 1901		1902
Exports	Tons	1,026,400	..	420,100
Imports	,,	143,900	..	410,700
Excess of exports . .	,,	882,500	..	9,400

The expansion in the internal demand for iron and steel in the States is chiefly due to the great prosperity of the railways. They have not only been buying rails extensively, but also have been purchasing heavily in the direction of rolling-stock and general supplies; thus sustaining the demand for a great deal of other material produced by iron and steel manufacturers. It is estimated by steel rail manufacturers that the railways will require at least 2,000,000 tons of steel rails for the year ending June 30, 1903. Orders for half this quantity have already been given. It is said that 1,250,000 of the 2,000,000 tons will be required for renewals, the remainder for extensions. Other causes of the enormous demand for iron and steel are the activity in the agricultural implement industry, and the fact that building operations are being carried on all over the States to an unprecedented extent, both as regards residential buildings and factories, In the construction of all buildings steel is being very extensively employed. The "boom" is being maintained month after month in consequence of the fact, which differentiates it from that which was witnessed in this country, that, in spite of the enormous demand for iron and steel, prices have been kept at a reasonable level. This has been largely due to the United States Steel Corporation—the great "Carnegie Trust"—who have firmly refused to raise their prices unduly; and consumption has thereby been stimulated instead of being checked.

But it is perfectly obvious that this state of affairs cannot last indefinitely, as the splendid business now being done necessarily leads to a flow of capital into the industries and to rapid extensions of the means of production. In every direction old works are being extended or new ones erected; so that by the end of this year, and still further by the middle of 1903, the productive capacity of the plant in the United States will be enormously increased. The total additions to blast-furnace capacity, all expected to be available by the end of next year, are estimated at close on 5,000,000 tons of pig iron per annum, equal to half the total capacity of British furnaces. Additions to be made to the existing number of steel furnaces are estimated to represent an output of 3,300,000 tons per annum available by the end of 1903. The ultimate outcome of the present state of affairs will therefore be over-production, or a capacity for over-production, on a scale exceeding anything the world has ever before experienced; and then will be brought into play the facilities now being organized, by the railroad and shipping interests as well as the manufacturers, for shipping large consignments of material to foreign markets to compete with the goods of Great Britain, Germany, Canada, and Belgium.

That time is not, however, yet—though financial authorities in the States are, we are told, already advising caution in view of "the chances of a reaction at no distant date"—and we are now concerned with the present effect upon British trade of the existing conditions, which may well last, in a more or less modified degree, for another six months. We say, in a more or less modified degree, because just now the situation is aggravated by the strike of the anthracite coalminers in the States and by a scarcity of coke (due partly to congestion on the railways), which prevent the existing plant from turning out its full capacity of iron and steel, thereby increasing the tendency to import from this country and elsewhere. The Board of Trade returns for August and the eight months ended therewith show plainly the influence of the American situation upon the trade of this country. In August, we sent to the States 69,972 tons of pig iron against 4563 tons last year, 1381 tons of old iron against 9 tons, and 5290 tons of steel against 1362 tons. The total effect during the eight months of the year is shown by the table on p. 804.

The figures are interesting as showing how the cutting competition of Germany and Belgium in our markets has practically counteracted the increase of our export trade to the United States. The reversal of the stream of trade with America gave us an improvement on balance compared with 1901 of 331,872

Iron and Steel Shipments, Jan. 1 to Aug. 31.

	1901. Tons.	Tons.	1902. Tons.	Tons.
Exports—				
To United States . .	86,316		315,801	
To all Countries . .		1,941,739		2,239,300
Imports—				
From United States .	133,604		31,217	
From all Countries .		537,764		740,053
Excess of exports—				
To United States. .	−47,288		284,584	
To all Countries . .		1,403,975		1,499,247

tons (47,288 *plus* 284,584 tons); but this improvement is reduced in the aggregate to only 95,272 tons by the increase in imports from other countries. The imports of iron, however, show an actual falling off for the month of August. So, unless they again increase, which is not so likely now that Germany and Belgium have got rid of their surplus stock and are taking up orders for America, the drain upon our supplies of iron (the stocks of which are exceptionally small) will become more appreciable. Fortunately, from the consumer's point of view, there are no signs at present of any substantial revival in the home demand, and the upward tendency of pig-iron prices is having a restricting effect upon that demand, as manufacturers of iron and steel goods cannot afford to pay enhanced prices for raw material. Moreover, the activity in the shipbuilding trade is now steadily declining—in August the orders booked only amounted to one-third of those completed—and that must before long have a decided effect upon the iron and steel position. Altogether, the situation in the iron markets of the world is decidedly complicated and interesting; the course of affairs in America being the factor that requires at present to be most carefully watched. Caution, without alarm, is the moral to be drawn from the existing state of things.

The exports of fuel for the month of August show a decrease in the total, and under every heading except "bunkers," but this is practically accounted for by the Coronation holidays and there being five Sundays in the month as against four last year. The figures are: Shipments for sale, 3,711,528 tons, compared with 4,003,009 tons and 4,173,499 tons in August 1901 and 1900 respectively; bunkers 1,352,355 tons, compared with 1,200,800 tons in 1901, and 966,736 tons in 1900. For the past eight months, the sales show: 1902, 28,710 244 tons; 1901, 29,080,628 tons; 1900, 30,217,726 tons; while bunkers, stimulated by exemption from duty, have gone up from 7,728,318 tons in 1900 and 8,936,937 tons in 1901, to 9,885,812 tons this year. In the total, therefore, the shipments of fuel out of this country during the first eight months of the year exceed those for the same period of 1901, which was a record, by 578,491 tons. The exports of coke and patent fuel, which are included in the foregoing figures, show decreases of 99,704 tons and 7618 tons respectively; so that the actual increase of coal exports is 685,813 tons. Owing to these increased exports, to the decrease in output due to the numerous stoppages at the collieries over labour disputes, and to the slight stir in pig-iron making, the coal market is for the present rather more firm than the general state of trade in the country really warrants. The uncertainty as to what the future has in store for the South Wales coalfields is another factor in stiffening the market for prompt delivery.

IMPERMEABLE MASONRY CONSTRUCTION.

It is rather the fashion of civil engineers in extensive practice to regard slightingly the engineering construction required in the course of development of an ordinary gas-works, which needs (say) a new gasholder every ten years or so. It has not always been sufficiently appreciated by these critics of gas engineering construction that what there is of it—as, for example, in the way of gasholder tanks—is apt to be of an extremely troublesome and vexatious character. The problem is that of making a deep tank in the ground, at a place which is not usually selected primarily for the purpose, perfectly water-tight; and that this is a simple matter, no civil engineer will grant. Looked at in this sense, the successful construction of a gasholder tank wherever it is required, should be classed among the greatest of engineering triumphs, as it is among the rarest of engineering problems. Consider for a moment how many works of a broadly similar kind are required to be absolutely water-tight. They are not numerous. Even water-works reservoirs, which come nearest to them, are not in all cases required to be as tight as a bottle, so long as they are structurally sound. But if a gas-works manager knows of a constant leakage, of however small an amount, from a gasholder tank, he can never be sure of what the legal consequences will be. Besides, the water-works reservoir can usually be placed in a spot selected for the purpose; whereas the gasholder tank must be made where it can be put, or where it is wanted to serve its purpose.

It is hardly necessary to argue for the retention of masonry construction for all purposes whenever it can be made available. Broadly speaking, ironwork construction in substitution of masonry is at best an expensive and perishable expedient. This is well understood in respect to the class of structures in question. But although the stock of published descriptive matter relating to the building of gasholder tanks is both large and of great practical value, there is no professional paper extant which treats in a general way the problem of building in impermeable masonry or brickwork. That is to say, no engineer has published anything on water-tight building, distinct from the particular application of impermeable construction to some special work. This is a gap that should be filled; for, unless a designer is well posted in the principles of impermeable building, he is liable to overlook some necessary precaution when he comes to do the work. Just as there are principles of bricklaying and masonry which underlie all examples of the craft, so the quality of impermeability by moisture is a special requirement which can only be fulfilled by having regard to a technic that can be isolated and studied in itself, with reference to resources which change with the times.

This is not to say that a mass of information relating more or less directly to the point of impermeability does not exist scattered through professional papers. This is the fact; but it has never been collected and formed into a body of doctrine. The result is that everybody who wants to build a gasholder tank hunts up precedents, and copies what has been done before in the light of his own experience and notions of what is essential to water-tight construction. In this way many good tanks are built, and some bad ones; and when there has been a mistake, it is a very costly and troublesome business to trace out and rectify. The probability is that the gas engineer never troubles himself about water-tight building construction until he wants a tank; and then it is quite possible that the work may have to be done by a contractor who knows no more about the principles of construction involved than does the engineer.

How vague and shifting is the knowledge of such matters commonly possessed by engineers is shown by what has recently transpired about building in very wet concrete and very wet mortar for brickwork. The older practice was the direct opposite. As regards concrete, the history of its use for building is one of the most remarkable exposures of the rule of superstition and senseless custom over the minds of so-called practical men, that could be found in all literature. At one period, concrete had to be made of the hardest stones all broken to one uniform size, and that a large one, carefully mixed with hydraulic lime or portland cement, wetted with the smallest possible quantity of water, wheeled in barrows to a height, and then shot down not less than 20 feet into its place, where it was on no account to be touched. Now the fashion is changed in every particular; but the progress of the newer methods has been by slow stages and in single steps, as one engineer after another asked himself the reason for the traditional practices. It is only very recently that the fashion of wet concrete, rammed until all the water and fine stuff comes to the top, and the whole appears to be nothing better than slush, into which a man would sink to his ankles, has been proclaimed as the correct practice. The present question that suggests itself is: How does this affect the point of impermeability? Take, again, the case of brickwork in mortar made very soft, possibly used with dry bricks. Those engineers who served their apprenticeship thirty years ago will remember the prevalence of a very different order of things. Mortar was as stiff as it could be worked by a strong wrist, the bricks were supposed to be saturated with wet, and the obligation was laid upon the builder to float in at least every third course with grout. Did anybody stay to reflect upon the principles of all these practices? Not at all. The builder set his bricks, if nobody was looking, with small dabs of mortar; and the grout-can was oftener kept for the sake of appearance than for use. It was no uncommon thing to be able to pour a bucketful of grout into any part of the contractor's wall without any visible effect.

What is the bearing of these facts upon the question of water-tight construction? Simply, that this quality should be traced through all modern practice in masonry. It is to be gathered from a recent issue of the "Engineering Record" that American technical opinion is coming to set increasing store upon this character of construction, if only out of regard to the condition of weathering. The more impermeable to moisture a building is, the better it will stand the weather. This consideration has not always been esteemed as of great importance, partly because, as ordinarily put together, masonry and brickwork are very permeable by moisture. Unless there was some special object to be attained by so doing, therefore, the question of impermeable construction was not raised. The old masters of the world in building, from the Egyptians onward, did not trouble themselves on the point, not having frosty weather to fear; but their influence in this regard has lasted long enough. Impermeability is now acknowledged to be an ideal for most masonry construction, as it is an essential for some; and the only pertinent question is, how to secure it most reliably and at the smallest additional expense, if any.

Obviously, concrete as prepared according to the old-fashioned way already described was anything but impermeable, having in it voids aggregating 40 to 50 per cent. of its volume. Such concrete was mostly buried as foundations, and the ground water could ebb and flow through it as though it did not exist in space. The next step was to add to the concrete mixture a sufficiency of small stuff—sand, or stone crushings—to fill these voids, and make a mass resembling natural stone. Even this, however,

leaves out of consideration the degree of wetness permissible in the final stage of the operation of laying the concrete, which is a point that at present rests upon the unstable basis of individual professional opinion. There is a guiding principle to be deduced from the facts that whereas few, if any, of the agglomerates employed in making concrete are impermeable, portland cement itself is so. It would appear to follow, therefore, that the more completely every fragment of the agglomerate, large or small, is bathed in cement, the more likely the resulting composition is to be water-tight. The indication points to the wettest concrete that will set in a solid mass. This is a parting of the ways between the users of cement concrete for marine constructions and for land structures. It must be assumed that for land purposes cement can be kept free from extraneous water for as long as may be necessary to set it. This may be a week or longer. As a rule, however, wet rammed concrete into which a man would sink over his boots will set in less time; and when it has set, it is impermeable.

The foregoing is one part of the study. The other refers to the treatment of brickwork, and of stone masonry, in order to render it impermeable. All experience goes to show that a waterproof cement rendering must be at least as rich as one of cement to two of sand, even when the cement is very finely ground. Renderings of neat cement are liable to fail through hair cracks; but this again is a subject which should be studied for itself, whenever the opportunity arises, so that on the occasion for a big work presenting itself, there may be an accumulated knowledge of what to expect. The making of concrete pavement without a crack is a good test. Lastly, of course, come the tar and asphalte mastics for waterproofing walls, the behaviour of which has to be learnt from observation, because it does not come by nature. In the United States, several experiments have been made in burying a thin steel skin of riveted sheeting in a mass of poor concrete. This is a special development of the reinforced concrete system of construction which can only be defended on very special grounds. It is mentioned here merely to show the importance of the problem of water-tight masonry, brickwork, concrete, or earthwork construction, and its Protean shapes. It is also a matter which engineers will be required to consider in the future more than has been customary in the past.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 831.)

THE Stock Exchange had a somewhat depressing time of it last week. The continued hardening of money was the chief dominating factor, and apprehension that yet greater stringency was in store effectually put prices down. Consols were conspicuously low; and on Friday they touched $92\frac{15}{16}$ once. But they made a quick, though partial, recovery before the week closed. Railways contined to see-saw—up a little one moment, and then down again as sellers took advantage of the fitful improvement. The Money Market, as already observed, was tight; and, unless relief should come, an advance in the Bank rate is not improbable. But if the close of the current quarter can be met without recourse being had to an advance, it may then perhaps be indefinitely postponed. The Stock Exchange was closed on Saturday; and, with business quiet and bad, no one desired it to be otherwise. In the Gas Market, there was a good deal more activity than in the previous week; but it did not bring into view any prominent feature. Prices of quotations were almost wholly unchanged; movements being confined to one alteration in the London Market and one in the Provinces. In Gaslight issues, there was an increased volume of transactions in the ordinary stock at even figures, which never ranged outside the limits of $88\frac{1}{4}$-$89\frac{1}{4}$; and the final mark was just midway between them. The secured issues were also moderately active, and prices were unchanged. South Metropolitan was quiet and rather flat. The first prices were at only 122, and the quotation fell a point; but the transactions subsequently marked were a fraction better. Nothing at all was done in Commercial. The Company will hold their meeting next week, with the pleasant prospect of declaring a higher rate of dividend. This meeting will, we presume, be the last of the belated fixtures imposed upon the Company by Parliament. Next year their new Act will be in operation; and it authorizes them to fix a date more in accordance with general practice. The Suburban and Provincial groups were quiet and unchanged in London; but in the local Exchange Sheffield was quoted at an advance *ex div.* Among the Continental Companies, there was hardly any business done, except in Imperial, which was very firm, and changed hands repeatedly at the top price. But for some reason or other the quotation was left standing unaltered. All the undertakings in the remoter world were devoid of incident. In the Water Companies, there were a few more signs of life and resuscitation after their long trance. Prices generally were not remarkable; but an advance of 3 was made in Southwark Ordinary.

In regard to the daily movements, it need only be said that the fall of 1 in South Metropolitan was on Tuesday, and the rise of 3 in Southwark Water on Friday.

ANOTHER CRYSTAL PALACE EXHIBITION.

SOME time ago it was announced in the "JOURNAL" that a Lighting, Heating, and Smoke Abatement Exhibition had been projected for the Christmas season at the Crystal Palace. As yet, we have received no official communication on the subject; but a copy of the prospectus has found its way to the "JOURNAL" office, and from it we learn that the exhibition is to extend from Dec. 13 to Jan. 17, and that the "Organizing Commissioner" is the same gentleman who took the most prominent position in arranging the exhibition which was held during the corresponding weeks of last winter. It is a matter for regret, if another exhibition is to be held at which gas engineering, lighting, and heating are to be represented, that it is not being carried out under the direction of a Committee of either the Gas Institute or the Institution of Gas Engineers, or both. Following up a suggestion made by Mr. W. R. Herring at the dinner which inaugurated last year's show, we strongly urged that this should be done, when it was considered expedient to hold another exhibition of the kind. At the present juncture, however, while the two bodies named are looking after the question of amalgamation, it is perhaps as well they should not engage officially in any project of the kind, but leave for a more opportune time the formulation and development of a display which would present to the public the power and wealth of achievement of the industry in a manner worthy of its greatness; and this can only be obtained by adequate influence. We write thus with the exhibition of last year fresh in mind; and we cannot help feeling that it is a pity that a second exhibition, in which it is contemplated that gas shall play the premier part, should so soon be again floated, without the countenance of some authoritative body of the industry. Knowing the views of many of the exhibitors of last year, and of several gas engineers who visited the exhibition, the result of the present venture can only be regarded with some misgiving.

The prospectus states that the exhibition is to be under the control of an Executive Committee from the Smoke Abatement Society and the "Society of Gas Engineers." Here we clearly have good cause for grumbling—not against the organizer of the exhibition, but against the "Society of Gas Engineers" for not having informed us of their existence. This, however, is perhaps an oversight. However, the assurance is given that the "distinguished patronage" already obtained for the exhibition "will be" a sufficient guarantee as regards its future success. But as no information is given in the prospectus as to who are the "distinguished" patrons, it is quite impossible to accept, or vouch for, the sufficiency of the guarantee. But the coming exhibition is merely to anticipate a "Great International Exhibition" in 1904, "which is already in course of formation." This is news; but we doubt whether it will be any inducement to substantial firms in the gas industry to know that, if they are represented at the present exhibition, they will be allowed a reduction of 25 per cent. in the one projected for 1904! The same consideration ought certainly to be extended to those who exhibited at the Palace last year—that is, if the great exhibition of 1904 is to be a display of sufficient merit for the gas trade to be represented at. But to speak plainly, we have no liking for exhibitions of this kind, that are initiated and organized by individual effort primarily for the pecuniary profit that is attached to them, and only secondarily for the general good of the industries they are expected and supposed to represent. The hard-working organizer should be properly paid by a representative committee of the industry out of rents or subscriptions received, when it is considered desirable by those most concerned to hold an exhibition. But there is something too much of the nature of speculation for personal gain about exhibitions such as that of last year for them to meet with general approbation.

But passing to other particulars, it is proposed by the Organizing Commissioner that the gas engineering section of the suggested exhibition shall be subdivided into eight other sections. The first, it is hoped, will show gas lighting in all its forms and as applied to many purposes. But in section 2—"Light and Heat"—it is intended that inventions shall be shown demonstrating the "radiant heat and light treatment, by the agency of coal gas, which has lately proved in England, America, and Germany of the highest therapeutical value for lupus, rheumatism, gout, &c." Then section 3 is to be devoted—if exhibitors come up to the mark—to gas-meters; while section 4 will show a laboratory for gas analysis, and light and heat testing, and be equipped with standard photometers. The latest advances in the evolution of apparatus for cooking and warming by gas will, if success attends the organization, be seen in section 5; while in section 6 will be represented gas plant, &c.—from the materials and apparatus up to the products. Section 7 is expected to be occupied by colliery exhibits, carburetting oil, oxide of iron, lime, &c.; and section 8 will be taken up by gas-engines. On the fourth page of the prospectus, is information as to the "coal smoke" abatement section.

If the exhibition is a success, we shall be glad; but, from what was heard after the last exhibition, it is rather to be feared that this one will find its being and end in—well, the smoke abatement section. The prospectus of the exhibition held last year aspired to great things; the present one, if anything, exceeds it. Will the aspirations be fulfilled?

THE CULT OF THE GAS EXAMINER.*

First Article.

THE compendious volume before us, which Mr. Abady brings forward as the lineal descendant of the late Mr. F. W. Hartley's modest little *brochures*, which have long since been out of print, evokes strange reflections. Has the cult of the gas examiner prospered so exceedingly since Mr. Hartley wrote his "Gas Analyst's Manual" that so voluminous an account of gas-testing apparatus and its use as that now given by Mr. Abady is really called for? We were hopeful that the gas industry was beginning to shake off some of the fetters which local authorities, with misdirected zeal for the common weal, have from time to time persuaded Parliament and Government Departments to place upon it. The "official" gas examiner is an excrescence consequent on the pin-pricks which local authorities have seen fit to administer to gas undertakings not under their own control; and if in the near future he softly and silently vanished away under the genial influence of an emancipating spirit, his unofficial counterpart on the gas-works would also of necessity disappear. Will Sir George Livesey be spared long enough to be able to effect this emancipation of the gas industry, or must we look to some strong man of a later generation to complete it? The struggle with the prejudices, arrogance, ignorance, and vested interests of local bodies and gas examiners will be a tough one; but we are fain to believe that the gas industry will triumph in the end, and that the gas examiner—and all that his office implies—will ultimately be relegated to a quite subordinate position, if not to limbo. The gas-tester on the gas-works will then give place to the technical chemist (whose position he now too often usurps), and the labours of the latter—no longer liable to be diverted to combat the wiles of the gas examiner and his employers—will be directed to improving and controlling methods of manufacture and the recovery and utilization of subsidiary products. Much may be expected from the technical chemist in this, his legitimate sphere of operation on the gas-works.

But the gas examiner is still actively with us, as Mr. Abady's book forcibly indicates; and being a person whose actions are ruled by authority and routine and not by knowledge and discretion, it is necessary that he should be provided with more or less stereotyped and hall-marked apparatus, and with directions for its use. Mr. Abady tells him where the apparatus may be obtained, and how to use it. On the whole, we think the gas tester will benefit by reading this book, and as it will doubtless find its way into the hands of many readers of the "JOURNAL," we will endeavour to indicate in the sequel the points on which it seems to us to be specially trustworthy or otherwise.

Three chapters and a number of appendices, covering in all nearly 180 pages, are devoted to photometry. Broadly speaking, there are officially recognized for gas-testing in this country two forms of photometer, one of which is for London and the other for the Provinces generally. Whether the London apparatus, which dates but from 1898, will survive can only be surmised; but it is a noteworthy fact, of which we think Mr. Abady makes no mention, that the Bill promoted by the South Metropolitan Gas Company last session, proposed in effect to abolish the use of the present London apparatus—*i.e.*, the table photometer and the Harcourt 10-candle lamp—for testing the Company's gas, and to substitute therefor the apparatus generally used in the Provinces, as prescribed under the Gas-Works Clauses Act, 1871. This attempt on the part of the progressive London Company, after more than three years' experience of the table photometer and Harcourt lamp, to get rid of them in favour of the bar photometer and oft-abused sperm candles, seems to show that they at least are not well satisfied with the present London apparatus. It would be futile to hazard guesses as to the reasons for what Mr. Abady—unless we misinterpret his views on the merits of the two forms of apparatus—would deem a retrograde proposal.

The table photometer of the Metropolitan Gas Referees appears to have escaped public criticism of a damaging character; and Mr. Abady raises no serious objections to its use. Perhaps in this connection, we ought not to ignore the recent remarks of Mr. W. J. Dibdin in a letter to the Town Clerk of Gravesend (*ante* p. 358). Mr. Dibdin there stated, *inter alia*, that the table photometer and Harcourt lamp gave 8 per cent. advantage to the Gas Company over the system recommended by the Committee which reported to the Board of Trade in March, 1895. This system included, it will be remembered, the use of Mr. Dibdin's pentane argand standard of light in place of the candles hitherto used with the bar photometer. Now, assuming that both are properly constructed, a bar and a table photometer will *cæteris paribus* give the same result; hence Mr. Dibdin implies either that the Referees' table photometer is scientifically faulty, or that the Harcourt lamp gives a light 8 per cent. less than its reputed 10 candles. The alternative is to assume that the bar photometers of 1895 were scientifically faulty, or that Mr. Dibdin's pentane argand standard gave 8 per cent. above its reputed value.

Mr. Abady does not help us to settle the doubt which Mr. Dibdin has raised as to the accuracy of one or other instrument, or the correctness of one or other standard of light. He refers to both standards as having a value of 10 candles; and as we gather that he has used both fairly extensively, it is improbable that a difference of 8 per cent. in their values could have escaped his notice. While conceding precedence to the Harcourt lamp because of its official recognition, Mr. Abady says the Dibdin pentane argand may, under certain conditions, be useful. If there exists a difference of 8 per cent. between the two standards, the utility of the unofficial one is not very evident, unless we are at the same time informed that it is necessary to apply a correction to results obtained with it. We are the more puzzled over the matter because Mr. Dibdin, who now states that the table photometer and Harcourt lamp give 8 per cent. advantage to the Gravesend Gas Company, earlier in the year gave evidence in support of the Bill by which the South Metropolitan Gas Company endeavoured to get rid of that photometer and lamp from their testing-places. Did he advise the Company that the apparatus which they were seeking to abolish gave them an advantage of 8 per cent.? Truly the ways of even veteran Gas Examiners are past understanding!

There is one point relating to the photometry of low-grade gas of which we find no mention, though it is of the utmost importance to gas undertakings which may be seeking powers for a reduction of the statutory illuminating power imposed upon them. We refer to the rate at which the gas is to be burnt in the statutory testings. Let us take the case of an undertaking which is obtaining power to supply 14 in place of 15 or 16 candle power gas. Should it accept the Gas-Works Clauses Act (1871) schedule in its entirety, and have the consumption of gas in the prescribed burner carefully adjusted to 5 cubic feet per hour, or should it follow the example of the South Metropolitan Gas Company, and obtain a special clause to the effect that the gas is to be consumed at such a rate as to give a light of 16 candles?

Speaking from memory, we think Sir George Livesey has stated, that the result obtained differs by about 1 candle, according to which of these two modes of burning the gas is adopted; so the point is one of no small importance to a gas company. Mr. Abady, so far as we have observed, makes no mention of the mode which has been legalized in the case of the South Metropolitan Gas Company since 1900, and bears the stamp of parliamentary authority. Instead, he implies that the recognized mode of testing 14-candle gas, when any departure is made from the provisions of the Gas-Works Clauses Act, 1871, is to consume the gas in the London argand burner at such a rate that it shall give a light of 14 candles. What precedent is there for this method? Surely nothing so authoritative as the decision of Parliament given in the South Metropolitan Act of 1900 in favour of another method.

On points such as these, which are of vital interest to gas companies at the present day, Mr. Abady is dumb, though he is critical on many matters of minor importance, which appeal more particularly to the petty spirit which, speaking generally, pervades the gas examining fraternity. On the broader issues of official gas testing, he says nothing.

We must, however, reserve further comments on Mr. Abady's work to next week.

* "Gas Analyst's Manual" by Jacques Abady, M.Inst.Mech.E. (Incorporating F. W. Hartley's "Gas Analyst's Manual" and "Gas Measurement"). London, E. & F. N. Spon, Limited; 1902.

OBITUARY.

Mr. CHARLES CARLOW, Manager of the South Queensferry Gas-Works, died there on Wednesday last.

Mr. ALEXANDER WINTON, who had been Manager to the Grangemouth Gas Company for over thirty years, died there on Monday the 15th inst. He was 67 years of age.

The death, at Southport, is announced of Mr. WILLIAM BROUGHTON, a native of Bolton. Deceased held the position of Vice-Chairman of the Gas Committee and Electricity Committee.

PERSONAL.

Mr. CHARLES WINTON was on Friday last appointed Manager of the Grangemouth Gas Company, in succession to his father, who died the previous Monday. Mr. Charles Winton has been Manager of the Moffat Gas Company for a year-and-a-half.

In consequence of the gift by Mr. H. A. WILLEY to the City of Exeter of the equipment and machinery of the Manual Schools, and his intention to grant a scholarship at some American or English technical university or college (which were referred to in our Editorial columns last week), the thanks of the Exeter City Council have been accorded to him, and it has been resolved that the necessary steps should be taken for conferring upon him the honorary freedom of the city.

The Directors of the Richmond Gas Stove and Meter Company have unanimously appointed Mr. THOMAS DWERRYHOUSE, of Warrington, to be Chairman in succession to the late Mr. E. W. T. Richmond. Mr. HORACE M. THORNTON, who has been for many years closely associated in the business with Mr. Richmond, is to be Managing-Director and Vice-Chairman of the Company. Mr. J. A. RANSOME, of Warrington, the General Manager, will, in addition to his present duties, supervise the general manufacturing work, and in this capacity will be Joint Managing-Director with Mr. Thornton.

NOTES.

Retaining-Wall Formulæ.

An addition to the literature of retaining-wall design has been contributed by Mr. G. C. Clark, in a paper read before the Engineers' Society of Pennsylvania. The author stated that the following formulæ have been adopted and used during the past five years by the staff of the Pennsylvania Railroad Company, presumably with satisfaction: For walls over 18 feet high: Thickness at bottom = $\frac{2}{3}$ height 3 − feet. For walls less than 18 feet high: Thickness at bottom = $\frac{1}{3}$ height + 3 feet. The two equations give the same result for a height of 18 feet—namely, 9 feet. No allowance is necessary for a surcharge of less than 6 feet. The construction is presumably stone masonry, brickwork, or solid concrete. One recommendation of the rule is that it is very easily memorized.

The Power for the British Westinghouse Works.

In view of the "Note" on this subject which appeared in the "JOURNAL" for July 22 (p. 210), the Westinghouse Company have sent us some explanation of their intentions as regards the provision of power for their Manchester works. The alternate-current, three-phase electrical system has been adopted; and Westinghouse type "C" motors, ranging in capacity from 5 to 50 horse power, are used in all departments. Electricity is generated by a number of steam-driven alternators of the rotating field type; and the generating sets are placed side by side in a reserved space at the southern end of one of the main aisles of the machine shop—steam being derived from an installation of Babcock and Wilcox boilers erected in a building immediately adjoining. Two types of Westinghouse steam-engines are at present installed—the vertical cross-compound Corliss, and the single-acting compound. It is the intention of the Company to show in the power equipment of their works typical examples of modern machinery manufactured by them; and with this end in view, the electric power generating plant is to consist of reciprocating steam-engines, steam-turbines, and gas-engines. Apart from the general interest which an equipment consisting of the most modern types of primary power producers is bound to attract, the working results, and the opportunities for clear comparisons which will thus be available, will doubtless be of great benefit from an engineering point of view. The Company point out that the reason why steam-engines were installed first at their works was that they formed the readiest and quickest way of securing a preliminary power supply, since steam-boilers were in any case necessary for various purposes. The present power producers are, however, only an instalment, and are not nearly sufficient in capacity to meet the full requirements of the works of the Company.

Cements for Metals.

In a recent number of "L'Industrie," the composition of various cements suitable for metals was given. M. Aurous, Chief Engineer in the French Navy, directed attention to the advantages of the cistern maker's cement, which he saw employed at Brest to stop extensive leakages in a plated coffer-dam below water, and which he recommended for general use on board ships to obtain perfect water-tightness. This cement is made as follows: Ordinary resin, 132 lbs.; tallow, 88 lbs.; quicklime, 0·66 bushel. The resin and tallow are heated to boiling, and then the powdered quicklime is thrown in. The mixture is removed by means of an iron ladle, and placed in water, where it is worked by hand and made into balls like glazier's putty. As it becomes hard in the air in 24 hours, it must be placed in hot water at the end of that time to make it malleable. It is applied like ordinary putty, with a knife or by the hand. It rapidly hardens in water, and retains its hardness in places where the temperature is moderate. When the objects to be united are to be exposed to a great temperature, litharge cement, which resists a temperature of 572° Fahr., should be utilized. This is made with very finely powdered litharge dried in a stove and mixed with glycerine. Setting is rapid and complete, and there is no great change in volume. The Americans employ it in all cases where the French use lead. Cast-iron cement is a mixture of iron or cast-iron filings, sal ammoniac, flowers of sulphur, and vinegar or sulphuric acid. It is employed in all machine work shops to stop flaws in cast iron. The proportions are as follows: 30 parts of filings, and one part each of flowers of sulphur, sal ammoniac, and vinegar, with some drops of sulphuric acid. A refractory cement, which can be employed for pieces placed in the fire is composed as follows: Bioxide of manganese, 10 parts; zinc oxide, 5 parts; borax, 1 part. All is kneaded with a solution of silicate of soda. Every foreman in a workshop has his own formula, which he maintains to be best, for making cement; and powdered minium, white lead, clay, crushed brick, plumbago, lime in powder, sulphur, borax, &c., are all employed.

Cheap Design in Iron-Work Construction.

The subject of structural costs for iron-work is treated by a "Manufacturer" in the "Engineer." The writer remarks that for such purely utilitarian purposes as most railway bridges and viaducts, "gas schemes," and the like, the question of the degree of finish to be exacted by the designer puts it into his power to vary the contract prices often pounds per ton. Also, he draws attention to the small items in girders and principals which often needlessly inflate prices. Connecting plates and links are often shown to be cut to various shapes; and many pieces are cut and trimmed in the double endeavour to save weight and make the work more sightly. It should be understood that whereas a straight-sided member can be sheared, a hollowed side must first be punched out and then hand-dressed—a much more expensive proceeding. For roofs of moderate span, design is a large feature in determining costs. For ordinary principals, the selection of bars or rods will be found to vary costs by from £1 to £4 per ton. Nowhere so much as in this class of work does the maxim "keep out of the smith's shop," so clearly apply. Forged eyes, forked and slot ends, middles, &c., run up the cost for workmanship to an alarming extent. Screwed adjusting rods for roofs, &c., are completely out of date; and the same may be said of the cotters that still figure in roof work. There is no reason why roofs should not be made of flat bars riveted up without any of these refinements, which are still taught in drawing schools. The judicious employment of cast iron for suitable members, as the louvre standards of roofs, is another source of possible saving. Generally speaking, whether structural iron-work be wrought, steel, or cast, it should be the rule to secure sufficient strength without indulging in the drawing-school refinements of "finish," which is only wasted. It is the same with castings; the guide being that in this material plainness of contour and outline is to be sought in preference to irregularities likely to make the core expensive. Cast iron does not lend itself well to acute angles or flat surfaces. Consequently, a plain, round column or pipe is one of the cheapest castings, whereas a hexagonal, square, or deeply fluted column is among the most costly and least trustworthy of cast-iron forms.

Gas-Engines for Fire-Brigade Purposes.—A remarkable installation of gas-engines is about to be made in Philadelphia, in connection with improvements in its fire-protection service. The proposed plant will contain ten 280-horse power, 18 in. by 22 in., Westinghouse three cylinder single-acting gas-engines, which will be directly connected to 1200-gallon triplex, double-acting piston pumps, working against a maximum pressure of 300 lbs. per square inch, and discharging into a 20-inch trunk main. Two 125-horse power 13 in. by 14 in. Westinghouse three-cylinder gas-engines will also form part of the equipment.

Lime and Magnesia in Water.—The subject of the determination of lime and magnesia in water is dealt with by Herr A, Grittner in the "Zeitschrift für angewandte Chemie" for last month. Titration with soap solution, as first proposed by Clark, and afterwards adopted by others, does not give accurate or reliable results; the temporary and permanent hardness determined in this way by different analysts being seldom the same. The author recommends the use of Pfeiffer's method for the magnesia or permanent hardness, and Wartha's method for the total hardness. These methods depend upon the titration of the water under examination with standard acid and alkali under specified conditions; and they do not differ materially from the method described by Hehner in the "Analyst" in 1883.

North of England Gas Managers' Association.—The fifty-first half-yearly general meeting of the North of England Gas Managers' Association will be held at Wallsend on Saturday, the 4th prox., when the President (Mr. A. B. Walker, of Walker-on-Tyne) will read his Inaugural Address. There will also be a paper by Mr. D. E. Garlick, of Barnoldswick, on "The Increased Consumption of Gas to be Obtained by the Use of Cooking and Heating Stoves." At the conclusion of the meeting, visits will be made to the Neptune Bank electric power station and the Willington Quay gas-works; and afterwards, on the invitation of the Chairman and Directors of the Walker and Wallsend Union Gas Company, the party will dine at the County Hotel, Newcastle-on-Tyne.

International Engineering Congress.—The Executive Committee of the Glasgow International Engineering Congress of last year have issued their report and abstracts of the papers read in the several sections. It has been edited by the untiring General Secretary (Professor J. D. Cormack), to whose great administrative ability, admirable tact, and geniality, the smooth working of the whole organization was chiefly due. The volume (which contains a preface by Dr. Robert Caird, the Chairman of the Executive Committee) will form an admirable and useful companion to the sectional reports. It places on record the names of the office-bearers and members of the various Committees, a list of societies who took part in the congress, of the foreign and colonial delegates, and of the honorary and ordinary members. Carefully prepared abstracts of the whole of the papers that were read in the nine sections form the chief feature of the book, but the discussions are not similarly treated. This is a pity, as the volume would have been enriched and made more complete by the epitome. However, the names of the speakers in the discussions are given. The volume supplies a graphic and well-focussed view of all sides of contemporary engineering; and, this being so, its publication is welcomed.

COMMUNICATED ARTICLES.

INCANDESCENT GAS LIGHTING IN WELLINGTON, NEW ZEALAND.

By R. G. Howell, Secretary, Wellington Gas Company.

[Written by Request.]

It will probably be no surprise to readers of the "Journal" if I say, at the outset, that the advancement of incandescent lighting in Wellington has been seriously handicapped owing to the high prices charged by the Australasian Incandescent Gas Company. This Company hold the sole control of the Welsbach and Sunlight patents for the whole of Australasia; and, at the time of writing, the cost of the "C" burner complete is 6s. 6d., and renewal mantles 1s. But it is satisfactory to note that these prices are to be immediately reduced, allowing the same burner to be purchased for 5s., and renewal mantles at 8d.; while the Sunlight burner will be 3s., and mantles 6d. Although these reductions will be helpful, the marked difference in the home prices as compared with prices in this Colony, is a cause of great irritation to our consumers, who are so constantly reminded of the position by the large number of circulars and price-lists which reach them; while they are prevented by the Australasian Incandescent Company from importing or using any burners other than those supplied by them, or through their appointed agents. A few years ago my Company consented to take up the sole agency in this city for the Australasian Incandescent Company. The agency had previously been in several hands; but the advancement of incandescent lighting, carrying with it increased sales of burners, &c., which may be dated from the time my Company took it over, has proved eminently satisfactory to the Incandescent Company.

Keen Competition with the Electric Light.

Wellington, as you are doubtless aware, is the only city in New Zealand which has both gas and electric light works established. Both are in the hands of private Companies; and I think it may safely be said that keener competition than exists here is hardly possible. The cost of electric light as an illuminant is 1s. per unit, with a sliding-scale of discount which to large consumers reduces the price to 5d.; but for motor and heating purposes one charge of 3d. is made. Gas is 5s. 10d. per 1000 cubic feet net, and the engine rate 5s. 5d. No meter-rents are charged.

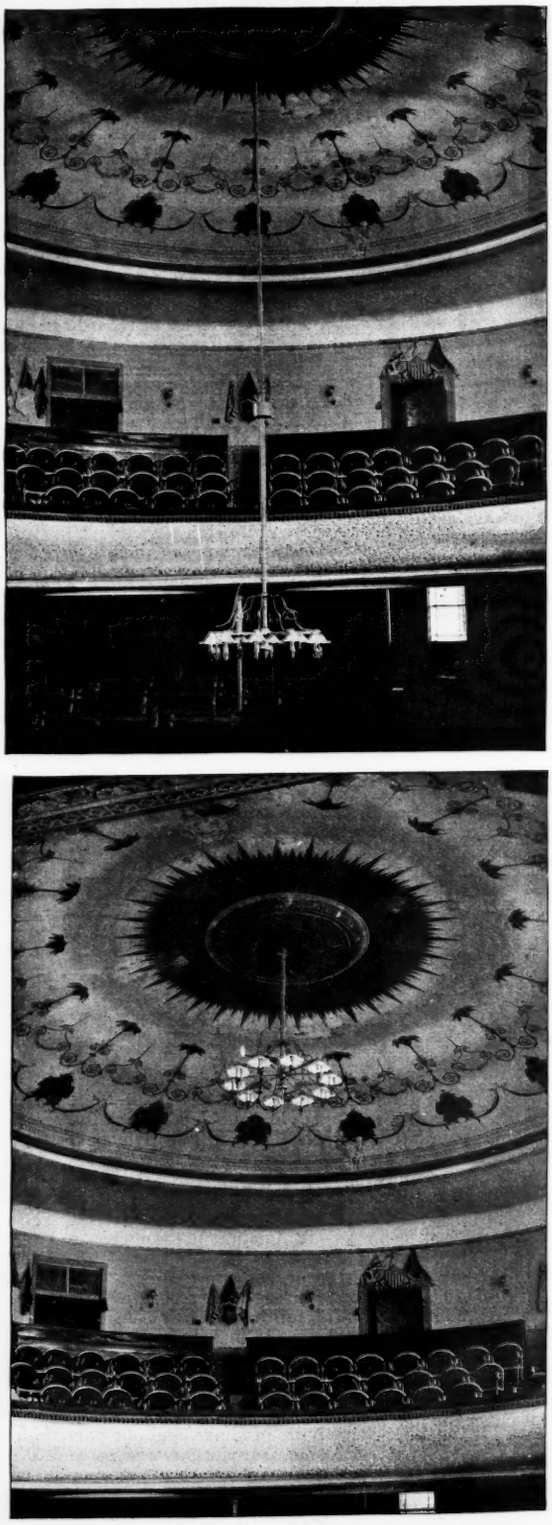
We have found in the past, especially in regard to new houses, that the convenience of electric light has greatly outweighed any advantage that may be claimed as to the reduced cost of incandescent gas lighting; while the absence of necessary attention to the cleaning of burners when the agency for them was not in my Company's hands, caused many to become dissatisfied with gas, and instal electric light. These disadvantages have, however, been largely overcome—the former, by an extended (and I believe) original development of the bye-pass system, carried out by a very capable officer in charge of our fittings department, Mr. C. B. Norwood, and to which I will refer later on; the latter, by the adoption of a system which I will at once explain.

Maintenance, with Renewal Charges Only—The Cleaning of Burner Tops.

A careful record is kept of every incandescent burner fixed, and a staff of inspectors periodically visit every consumer using burners, clean them, and fix any necessary renewals. The cleaning is done free; a charge for renewals only being made. Each inspector makes a written report daily of the houses visited, and draws special attention to any dissatisfaction he becomes cognizant of. By this means, we keep in close touch with our consumers (now numbering nearly 7000), and are accordingly able to give special attention to anyone having a partiality for electric light. If desired, the upkeep of burners at a given price per annum is undertaken, but there is little demand for this.

It should perhaps be mentioned that the cleaning of burners rarely takes place at a consumer's residence, as it has been found more satisfactory and expeditious to do it at the works. Accordingly, each inspector, before starting on his rounds, is handed a certain number of clean burner tops, together with chimneys and mantles; and at each house he has only to remove the dirty burner top, replace it with one of the clean ones taken out, and clean the chimney. At the end of the day, the dirty tops are checked against those taken out by him in the morning; and they are afterwards sent to the fitting-shop to be cleaned.

For cleaning the burner tops, we have two 25-gallon copper boilers, one square earthenware vessel, 21 in. by 9 in., and one ordinary cold-water trough. Each of the copper boilers is fitted with steam-coils, suitable overflows, and a waste-plug. By this means, they are easily cleaned. In the first stage of cleaning, several dozen of the burner tops are threaded together on a piece of wire. They are then placed in a caustic soda bath, and lowered into one of the copper boilers, where by the aid of the steam-coils, all dirt or greasy matter is removed. The tops are afterwards taken out two at a time, dipped into the earthenware vat containing nitric acid, and are then quickly thrown into the cold-water trough, as the acid would obviously destroy the brass if allowed to remain. From the cold-water trough, they are put into the second copper boiler, which contains only clean water, kept boiling by the steam-coil. This removes any traces of the acid which might remain after the dipping process has been gone through, and which, if allowed to remain, would tend to discolour the brass. On removing the tops from the boiler, they are placed



Telescopic Lighting Arrangement at the Theatre Royal Wellington, New Zealand.

in a drying-oven, which is heated from without; and there they remain until thoroughly dry. Finally, they are carefully examined, and new gauzes or clay rings fitted if required. They are then ready for return to the show-room quite bright and perfectly clean, and, in fact, to all intents and purposes as good as new. By this process, over fifty burners per hour can easily be cleaned and repaired. A further satisfactory feature of this process is

that the tops do not quickly lose their bright colour, although they are not relacquered. In connection with our system of inspection, I need hardly mention that our inspectors lose no opportunity of persuading consumers to replace old chandeliers or other unsuitable fittings, as it goes without saying that in this way the life of mantles is greatly shortened.

A Word in Passing as to Cookers and Fires.

We have, I think, show-rooms and offices equal to any in Australasia. A large stock of fittings of every description is kept; and last year we succeeded in disposing of cooking-ranges alone at an average of one per day. This average for a town of the size of Wellington I consider most satisfactory; but it has not been achieved without extensive advertising and canvassing. We fix cookers and "Malta" grills entirely free of cost; also new services, providing they do not exceed 100 feet. Periodically, we thoroughly inspect and clean all gas-fires free of charge; and although the cost is somewhat heavy, yet we have found their use is thereby greatly enhanced, and the increased consumption of gas well repays the outlay.

Automatic Lighting of High Placed Incandescent Burners.

Adverting now to the question of the convenience of incandescent lighting, and more especially to high ceiling lighting, I think the accompanying drawings and photographs of installations will be interesting. It seemed for a time as if electricity must have a monopoly of this class of lighting, as the gas arrangements even in their most improved form were anything but satisfactory, chiefly owing to the difficulty of lighting. Of course, an elaborate system of electric ignition was possible; but this, like most other attempts to meet the difficulty, was prohibitive on account of the cost and liability to get out of order. However, our Mr. C. B. Norwood has invented an ingenious arrangement, which is described later on; and by its use high ceiling incandescent lighting has not only become possible, but is a formidable competitor with electric light.

The troubles hitherto experienced were: (1) How to light the burners. (2) How to light the pilots if one or more were blown out, either by concussion, which in a theatre can be so easily caused, or by a stoppage in the nipple. (3) How the burners could be kept clean and the mantles renewed with the least possible expenditure of labour. These difficulties have been overcome by the lighting being entirely automatic in its action, and consequently saving the fitting from many vibrations, and so prolonging the life of the mantle.

The gaselier, a drawing of which I send, was designed for, and fitted in, the Theatre Royal here nearly two years ago; and the mantles have only been renewed once during that period, although they have been in use every night. The fitting was made in my Company's workshops, and the work of installation carried out by our own staff. All the lights, including the side lights round the dress circle, the footlights on the stage, and the arc lamps outside the theatre, are bye-passed to a convenient place behind the stage, so that any set can be thrown off or on at will.

The following is a detailed description of the gaselier already in use at the theatre I have mentioned; and its success, and the positive proof of it, lies in the fact that it has led to a similar fitting being placed in the Opera House hitherto lighted by electricity, while several of the large churches (interior photos of which I also forward) have also adopted the system.

With reference to the gaselier, it will be noticed that: Fig. 1 is a sectional elevation, showing the general arrangement of supply-pipes, revolving lighter and drum, mercury seals, and automatic lock-grips. Fig. 2 is a sectional elevation, showing in full the automatic lock-grip. Figs. 3, 4, and 5 are sectional views, showing the arm terminals, which connect the burner pendants to each arm. They are specially designed in the way shown, so that the bye-passes are independent of the main supply. Fig. 6 is an

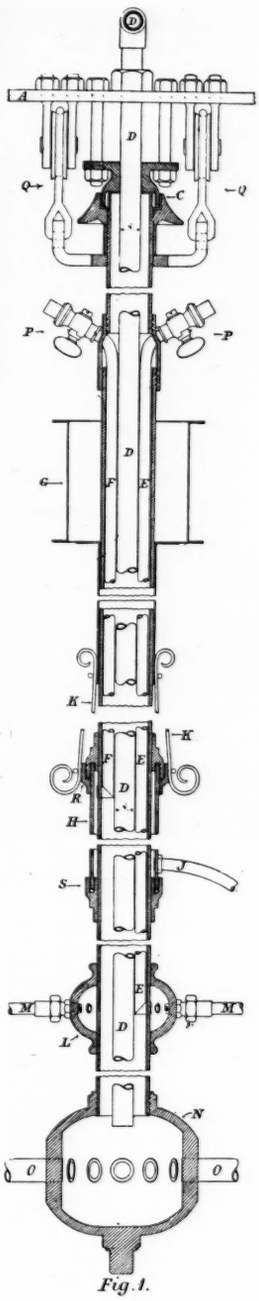


Fig. 1.

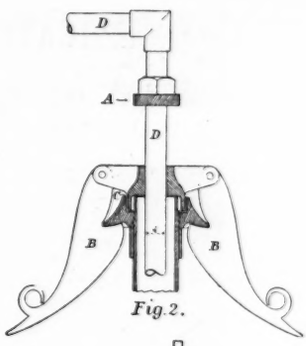


Fig. 2.

Fig. 3

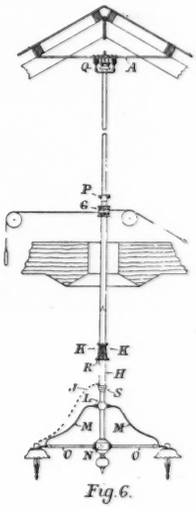


Fig. 6.

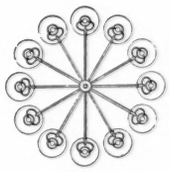
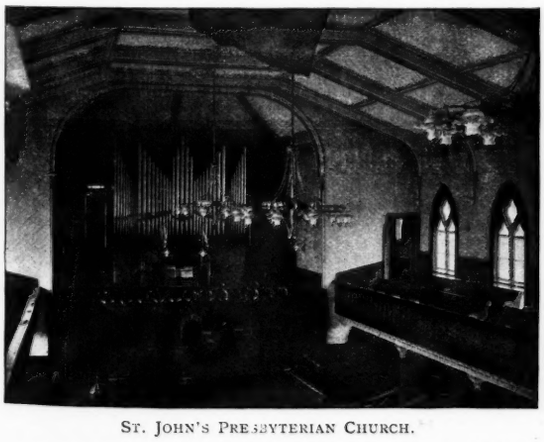
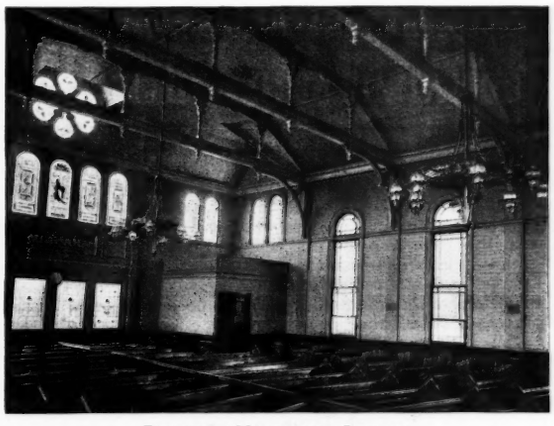


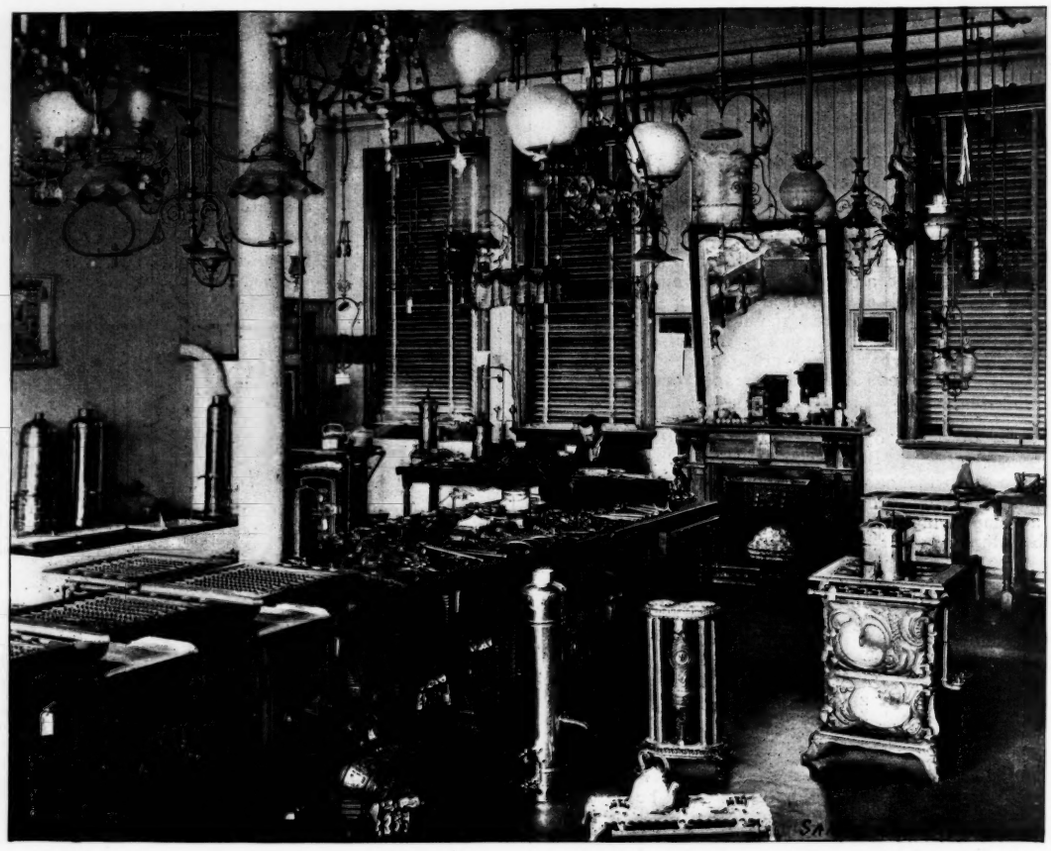
Fig. 7.

Centre Reflecting Gaselier for Public Buildings, as Erected at the Theatre Royal and Opera House, Wellington, New Zealand.


St. John's Presbyterian Church.


Primitive Methodist Church.

Church Lighting at Wellington, New Zealand.



PART OF GAS COMPANY'S SHOW ROOM, WELLINGTON, NEW ZEALAND.

elevation showing the gaselier in position. Fig. 7 is a plan showing a number of burners.

The gaselier is suspended from the topmost point of the roof above the ceiling by an iron bar marked A. From this bar is bolted an automatic lock-grip B (fig. 2), and also the rim which dips into the mercury seal C. The whole gaselier can be lowered to the floor or raised by two small flexible steel ropes Q, which are actuated by a very simple ratchet winch over two small iron pulleys bolted to the iron bar A. The lock-grips B are forged wrought iron, and are hinged with a pin to the top part of the mercury seal C. It will be seen by reference to fig. 2 that, as the gaselier is drawn up, the disc on the mercury seal C pushes out the lock grips which are hanging loose wlth their weight turning inwards. When the gaselier is raised to the proper position, these grips swing inward by their own weight. This assures a perfect seal, and the gaselier being held quite firmly in position. The main supply-pipe D (fig. 1) passes down the centre of the gaselier to the main body. It also acts as a guide-bar in lowering and raising the gaselier, for which only one attendant is required. E (fig. 1) is the supply to the bye-pass, and F the supply to the revolving lighter. They both terminate just above the ceiling as shown at P (fig. 6), and are then connected each with a moveable flexible steel tube, so that they can be readily removed for lowering the gaselier. The drum G is connected to the revolving-piece H by means of the clips K and a slight casing, which fits loosely on the stem of the gaselier. The revolving-piece H carries the lighting-tube J, and is fitted with two mercury seals running on ball-bearings at the bottom, details of which are shown in fig. 1. The lighting-tube J is held in position by a stop and a balance-weight, which is suspended by a light chain or rope turned twice round the revolving drum, and then over a pulley. The lighter is made to revolve by a similar line, which is turned twice round G in the opposite direction. This is conveyed by pulleys or suitable cranks to the switch-board on the stage or other suitable position from which it may be worked on the bell-pull principle, or by direct pull. The act of pulling this opens a valve and admits gas to the lighter supply-pipe, and also causes the lighting-tube J to revolve as it passes over the first lighted burner. The gas from the lighting-tube becomes ignited; and it can then be passed round the entire circle of lights, thereby lighting any burner which may have become extinguished. It will be seen that it is not necessary to have all the burners bye-passed, so long as there is one bye-pass alight. The remainder with the aid of the revolving-lighter J may be lighted with the utmost ease. As this gaselier is bye-passed by a separate supply, the whole of the work of lighting and extinguishing is done from the switch-board. L (fig. 1) is a brass boss, into which the bye-pass supply E discharges, and from which the bye-pass tubes M are taken, as shown in fig. 6. Entering on top of the arm terminals (the details of which are shown in figs. 3, 4, and 5), the burner pendant being blocked off, the bye-pass supply goes down one side, and the main supply down the other.

NOTABLE FIGURES.

In conclusion, I may mention that, in spite of the keen competition of the electric light, my Company for 1901 were able to show an increase in the gas sold of over 13 per cent., and such increase is being maintained. The gas manufactured last year was 133 million cubic feet, and the gas unaccounted for 4·94 per cent. The gas made per ton of coal (all small Westport), was above 11,000 cubic feet; and this satisfactory return is greatly due to the ability of our Engineer (Mr. H. Birch). The works are equipped with up-to-date appliances, including regenerative settings, and coal elevating and conveying machinery. All the ammoniacal liquor is concentrated in preparation for its manufacture into anhydrous ammonia.

THE INCANDESCENT BURNER IN THE CHURCH.

By J. H. TROUGHTON, of Newmarket.

The subject of the lighting of places of worship is one which should have the special attention of all gas managers for several reasons which are so obviously advantageous that I need not particularize them. But in the hope that they may be of use to some of my fellow gas managers, I have put together a few notes as to the experience I have gained in successfully lighting up some of the churches of Newmarket with incandescent burners. In the first place, I may say that, in my opinion, the incandescent burner is admirably adapted for this purpose, especially when the existing church fittings are suitable for either Kern or "C" burners, when they can be utilized at small cost, and effect a great saving in the consumption of gas; while the illuminating power can be increased to any desired extent, by the number of burners fixed.

The first church I lighted was St. Mary's, Newmarket, which was previously lighted by means of drop rings or pendants suspended from the centres of each arch in the nave. But these were considered too mean for having incandescent burners fixed on them; so the Vestry took my advice, and consented to purchase new coronas of a simple yet tasteful design, being of polished brass, each having three arms and harmonizing with the surrounding church furniture. On each of these arms a No. 3 Kern burner was placed, fitted with opal globes, with clear bases —and, there being six arches on each side, twelve triple coronas were substituted for the twelve old-fashioned rings which had

four flat-flame burners on them—thereby considerably beautifying the church, as they look well even when not lighted.

For the chancel, the existing 24 flat-burner corona was converted to take four No. 3 Kern burners. Two arches on one side, and one on the other side, had fixed on them coronas, burners, and glass similar to those in the nave. But it was found impracticable to fix a corona in the arch opposite the organ, on account of the organ pipes; so two No. 3 Kern burners were placed on suitable brackets fixed to the pillars, and these effectively light the organ, choir, and chancel.

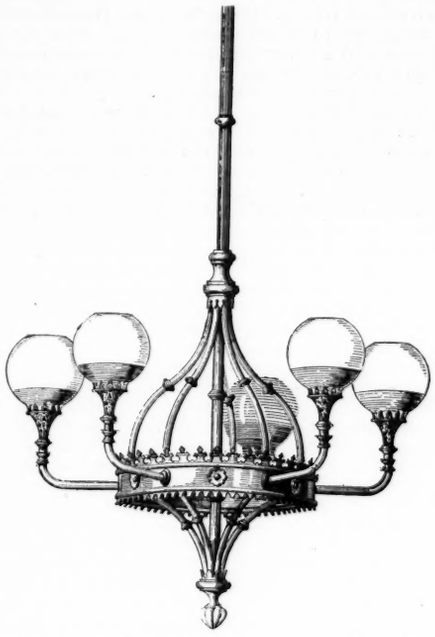
Thus in the nave 48 flat-flame burners were replaced by 36 No. 3 Kern burners, and in the chancel 15 No. 3 Kerns replaced 40 flat-flame burners, or, in all, 51 Kern burners replaced 88 common burners, which I estimate formerly consumed about 450 cubic feet per hour, as compared with the 51 Kerns, consuming about 150 cubic feet of gas per hour; while the light given by the new system is nearly three times as much as there was previously. The illustration shows the form of corona adopted.

The actual consumption during the first complete quarter bears out my estimate as follows:—

88 flat-flame burners in use for the quarter ended March 31, 1901, £6 18s. 9d.	51 No. 3 Incandescent Kern burners in use for quarter ended March 31, 1902, £1 11s. 5d.

The following quarter, ended June 30, compares in about the same ratio.

The new system has satisfied all connected with the church. The atmosphere has not been vitiated as it was before; and during the summer the church was comfortably cool, the incandescent burners creating sufficient heat to promote healthy ventilation. Each corona is fitted with a cock; but these are



seldom used, as on each side of the nave, and in the chancel, separate cocks are placed, which control the sections mentioned, and regulate the gas so effectually as to prevent the burners hissing. No governors are employed; nor are they necessary, as the above-mentioned arrangement of cocks (which were previously in use) are quite ample for regulating or controlling the gas pressure.

It is interesting to note that the two cocks which are fixed on a 1¼-inch rising feed-pipe to supply each side of the nave, have a small bye-pass of ⅜-inch tube, fitted on with a ⅜-inch cock, formerly used to turn the gas down for purposes of economy, is now found to pass sufficient gas for the 18 Kern burners. This points to the fact that consumers who formerly could not get sufficient gas through small and inadequate gas-pipes for flat-flame burners, can now get quite sufficient for the supply of incandescent burners.

It must not be inferred from this that I advocate leaving existing small fittings alone, as it is more important than ever to-day to pull out inadequate pipes, and insert larger ones; for while we are reducing our customers' bills by recommending incandescent gas-burners, we must not overlook the fact that the great bulk of gas required in the future will be for heating and cooking.

The cost of fitting up the church described was about £50. Two other churches have adopted exactly the same system after seeing it installed at St. Mary's. In one of them, no other regulation is provided beyond the ordinary main cock; and this is found to be ample when about three parts turned off.

The third church is being fitted up at the present time with ten 3-arm coronas, but with No. 4 Kern burners. The existing chancel corona is to have six No. 4 Kern burners fixed upon it, at a cost of £38 15s., complete with new fittings; and this contract was won in competition with the Electric Light Company, who offered to wire the church free, charging an extra ⅓d. per unit for current used, or 7½d. I may here say that it is doubtful whether my Company would have obtained this order, had I not been able to point to the experience gained in lighting the first church, and guaranteeing to give them a far better light than they obtain at present at less than half the cost that they have been paying; and I am perfectly certain this can and will be accomplished.

I do not think it a good plan to put incandescent burners on standards in churches where it can be avoided, owing to their being so liable to vibration. At the same time, I know of churches where this has been done with fairly satisfactory results, so far as economy and upkeep are concerned. At St. Mary's Church only six mantles were renewed in the first six months of this year.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Twenty-Eighth General Meeting of the Association was held last Wednesday at Chelmsford, under the presidency of Mr. E. W. Smith, the Engineer and Manager of the local Gas Company. The day was fine, and considerable pleasure was derived by the visitors from the programme arranged.

The Gas Company's Welcome.

In the first place, the members assembled at the White Hart Hotel, where the Chairman and the Directors of the Gas Company entertained them to luncheon. There they made the acquaintance of Mr. W. W. Duffield (the Chairman), Mr. W. P. Gepp (the Deputy-Chairman), and their fellow-Directors, Mr. Charles Pertwee and Mr. Frederick Wells. The Secretary of the Company (Mr. R. E. Wackrill) was also present; and the honour of representing the civic authorities fell to the Deputy-Mayor (Mr. F. A. Wells). The repast was thoroughly enjoyed; and, at its close, the cordial thanks of the members were tendered to the Chairman, on the motion of Mr. R. Brown, seconded by Mr. John Barton.

Mr. Duffield, who was heartily received, said the time had arrived when he must offer to the Association, on behalf of the Gas Company, the most cordial welcome. The Directors felt from the first that there was only one proper way of receiving the representatives of kindred companies, and that was to offer them hospitality. He could assure the members that whatever pleasure they had in coming there that day was exceeded, if possible, by that of the Chelmsford Gas Company. He should like to add that he had been connected with gas now for a great many years. He happened to be the Chairman of two Gas Companies; and gas had always been very kind to him. (Laughter.) There was no town in England where there had been greater competition with gas than in Chelmsford, where one of the largest electric companies had their head-quarters. He was glad to be able to to tell the gas engineers before him, in case any of them might be threatened with the same competition elsewhere, that if they were as successful in combating electricity as they had been in Chelmsford, they would have nothing to regret.

The Business Meeting.

The meeting was shortly afterwards held in the Shire Hall, where, at the commencement, Mr. Richard Brown (the retiring President) occupied the chair.

The Hon. Secretary (Mr. T. A. Guyatt, of Ely) read the minutes of the previous meeting at Boston; and, on the proposition of Mr. John Carter (Lincoln), seconded by Mr. F. Lennard (London), they were confirmed.

Membership Additions.

Moved by Mr. J. H. Troughton (Newmarket), seconded by the President-Elect (Mr. E. W. Smith), Mr. W. Methven, of Beccles, was elected a member, and Mr. J. Arnold Norcross, of London, an associate member.

A Vote of Sympathy.

The Chairman said he had a sad duty to perform before leaving the chair, and that was to move a vote of condolence with the relatives of the late Mr. Chester, Mr. Bridge, and Mr. Richmond. Mr. Bridge was situated in the northern part of the district, and was well known to many of the members in that area, and by all he was highly respected. Mr. Chester was a gentleman whose reputation as a gas engineer was world-known; and the excellent way in which he carried out the works at Nottingham was an example to them all. Mr. Richmond's death they looked upon as more of a tragedy than anything else. For a gentleman to go

down on a holiday with his wife and family, and meet with his death, was one of the saddest things they in the gas industry had ever encountered. The least they as an Association could do was to express their deepest sympathy with the families of their late friends in the heavy bereavements they had sustained.

The PRESIDENT-ELECT said he seconded the resolution with feelings of sadness. He was acquainted with all three gentlemen; but perhaps he knew Mr. Richmond better than any of them. When they remembered that he was a frequent attendant at their meetings, was an associate member, and was with them in the fulness of life at the last meeting, also the prominent part he had played in the gas industry in promoting the sales of gas by the energetic way in which he had developed his business and introduced his cooking-stoves, and not only that but the spurt his energy had given to the whole of the gas-stove trade, he thought he might say that they would feel his loss very acutely.

The motion was carried by the members silently rising.

THE NEW AND THE LATE PRESIDENT.

The CHAIRMAN said his next duty was to vacate the chair and introduce to the members their new President. Mr. Smith was a gentleman well known to them all. He had served on the Committee, last year took the office of Vice-President, and this year was unanimously elected to the highest position the Association could offer to its members. He was a gentleman who was highly respected by them all, and they well recognized his abilities in the gas profession.

In taking the chair, Mr. Smith had a very cordial reception.

The PRESIDENT remarked that perhaps the first thing he ought to do was to propose a vote of thanks to the retiring President. Mr. Brown they all knew as a man of tact, with a strong personality. He had made many friends during the twelve months he had held the office of President; and he was sure they would all accord him hearty thanks for his services.

Mr. H. WIMHURST seconded the motion, which was cordially agreed to.

Mr. BROWN, in responding, thanked the members for their unanimous vote. What little he had done for the Association had been to him more a labour of love than anything else.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty to-day should be to thank you, which I now do very sincerely, for the honour you have conferred upon me in electing me to the presidential chair of the Eastern Counties Gas Managers' Association. It has frequently puzzled me not a little of late to find a good reason why the greatest honour any Association can confer on its members should have fallen to my lot. It cannot be an acknowledgment of long service, inasmuch as I have only been among you some five years; nor can it be that I have taken a prominent part in the business of the Association, nor for any conspicuous ability displayed either at your meetings or elsewhere. Nevertheless, whatever may be the reason, I shall, while occupying the position you have placed me in, endeavour to carry on the work of the Association conscientiously and to the best of my power, for its good in every way. When, however, I remember how ably the duties devolving on the President of a District Gas Association have been discharged by my predecessors in office, I feel that the mantle they have successively worn has fallen on unworthy shoulders.

The preparation of an inaugural address has been described to me as being a literary effort which should not present any great difficulties to a practical gas engineer. "You can always fall back on your experience," has been advanced as a sort of comforter. It has also been described as the *pièce de résistance* of an Association meeting. If the latter is the case, then the preparation of an inaugural address is not so light a matter as some would have us believe; and I incline to the latter opinion. Naturally, in looking round for interesting subjects to lay before you, one's ideas turn to a review of the work done, and the progress made, during the year in matters relating to our profession. In making that a starting point, I cannot, perhaps, draw your attention to such new departures or discoveries as some previous years have been so rich in. Still, great progress has been made, and new ideas and inventions have been brought under our notice.

The changes that are taking place in the methods of gas production in our large towns and cities are considerable, and may yet mark an epoch in what may be termed the progressive age of the gas industry. Take, for instance, the experimental work carried out by Professor Vivian B. Lewes and Mr. S. Y. Shoubridge at the Crystal Palace District Gas-Works, a report of which was read by the first-named gentleman at the Glasgow Congress, in which he showed the economy derived from an admixture of blue water gas with coal gas in the retort during the process of carbonization, and how the saving was effected by the former gas taking up some of the lighter hydrocarbon vapours given off during the distillation of the coal gas, and thereby considerably reducing the amount of benzol required in the subsequent enrichment of the combined gases to obtain the necessary standard of illuminating power. By using hot water gas, we are told by Professor Lewes that even much better results than those already obtained might confidently be looked forward to.

This view appears also to be held by Mr. Thomas Holgate, of Halifax, who, in his address to the members of the Institution of Gas Engineers, gave a sketch of an ideal gas-works,* the aim of which was to be to so order the counter-current principle of the Mond gas process "that the sequence in itself shall be recuperative without the aid of extraneous appliances." This is to be effected in the model gas-works Mr. Holgate foreshadows by a very clever manipulation of the recuperative principle of using waste heat to the fullest extent for generating producer gas, combined with automatic machinery for handling hot coke, and with the employment of water gas—generated also in a recuperative manner—for separating hydraulic main tar into pitch and volatile vapours, which latter are to be permanently gasified and thus form part of the enrichment. The cycle is to be such that, "by a scale of ascending and descending temperatures," the "heat units that are saved will be more conspicuous than those that are lost." The coke, which will be gasified to only 25 per cent., will leave the producers in a harder condition than usual, and will contain less sulphur, arsenic, and other impurities, owing to its contact with steam and air, thereby rendering it more suitable for metallurgical and other purposes.

The whole details of the scheme are so beautifully thought out that I commend them to you for careful consideration; and I regret that I cannot do more than touch lightly upon them here. Such a condition of things, if it could be brought about—and Mr. Holgate is evidently of opinion that it will form our method of operation in the future—would result in utilizing calorific forces now going to waste, as well as attain the end suggested by Professor Lewes, which must effect enormous saving in the production of illuminating gas, and thereby place in our hands further means of successfully coping with the competition to which we are subjected by electricity on the one hand and petroleum oil on the other. The success which has attended the Crystal Palace District Gas-Works experiments, together with the results obtained by Mr. Glover with the Dellwik process at West Bromwich, not to mention what is being done by several other engineers who are devoting themselves assiduously to this important question, encourages us to take a most optimistic view of the future position of the gas industry.

Although most of us present to-day represent works of small and medium size principally, and may not perhaps be in a position to adopt the expensive apparatus and plant which is to give such a degree of efficiency and cheapness in production as the Crystal Palace District, West Bromwich, Edinburgh, Halifax, and other large concerns enjoy, it nevertheless follows, in the natural order of things, that modifications of the more ambitious types of apparatus, carrying some proportionate advantage and improvement, follow in their wake, and find their way into the lesser and more humble works. We, therefore, although we may not now be players in the first team, may yet enjoy, and perhaps take part in, the game eventually. Meanwhile, let us wish those gentlemen every success in their estimable work.

As something distinctly new and novel to us, let me draw your attention to the exceedingly clever invention brought under our notice at Southampton last June by Mr. T. G. Marsh, for measuring large quantities of gas. This should prove invaluable for sectionalizing—which was one of the uses to which it was suggested it might be put—both in the works and on the district mains. An instrument so small in itself—requiring, as it does, little space to contain it, as compared with the huge station meters, and the large buildings for housing them, at present in use—is entitled to our careful consideration when we are contemplating alterations or extensions in this department of gas-works apparatus. We have also had before us another new thing in the way of gas-measuring appliances—the "Positive" meter, for which it is claimed that it registers with absolute accuracy the smallest quantity of gas. Judging from what we saw of this meter at our meeting in Boston last April, I am of opinion that the inventor's claims are capable of substantiation, and that the instrument will, for experimental if not for general use, prove a most valuable one.

It is gratifying to find that each succeeding year brings about a better state of things both for gas suppliers and gas users in the matter of illumination by means of incandescent burners and mantles; and the good work done by Sir George Livesey in his efforts to settle the vexed question of proprietary rights to supply mantles for incandescent burners, and the costly litigation of the Welsbach and other companies, entitles him to our gratitude and thanks. The understanding which has been arrived at between the manufacturers and suppliers of mantles—including the arrangement for the payment of a small royalty to the Welsbach Company—appears to be an equitable and a wise one, and it has had the effect of placing on the market mantles of good quality at reasonable prices. Gas undertakings as well as consumers will, in consequence, benefit very considerably from the change which Sir George Livesey has been mainly instrumental in bringing about; and we must all agree that the good which has been done in this direction during the present year will be felt in very great measure.

One cannot but indulge at times in retrospective thoughts; and when we think of incandescent burners, and of the price charged for them some ten or twelve years ago, and compare these with the prices of the present day, the enormous reduction which has taken place awakens in us a feeling of great satisfaction with the changed state of affairs. I well remember having

*See "JOURNAL," Vol. LXXIX., p. 1179.

paid 18s. each for burners and 2s. 6d. each for mantles—mantles, too, that would almost fall to pieces if you coughed or sneezed while you held them in your hand. Now the best make of burners may be purchased retail for 1s. 9d. each, and mantles which you may handle, and of infinitely superior quality too, may be bought at from 4½d. to 6d. each. These are surely prices which should bring incandescent gas lighting within the reach of all classes.

A reference to the subject of incandescent gas lighting at the present time would be incomplete without something being said about the use of this system for lighting the public streets of our towns and cities. No one interested in artificial lighting can inspect the brilliant installations of high-pressure incandescent lamps erected by Mr. William Sugg in the Strand and Whitehall and other parts of London without a feeling of admiration for the high degree of efficiency obtained. This system, we are all pleased to see, has been adopted not only in London, but in many provincial towns; and for excellence and economy, it is far superior to electricity as used for street lighting. Of self-intensifying lamps, the most notable examples are perhaps those known as the Lucas, Scott-Snell, and Welsbach—all of which compare favourably as to light-giving properties and economy with any artificial lighting agent in use. I should like to add that there is a later lamp—the Podmore and Thomas, of which I have had a specimen sent down for examination. For ordinary street lighting, a No. 3 Kern burner, fitted with an anti-vibrator and a suitably designed lantern, is incomparably superior to anything I have seen in the shape of electric incandescent lighting for our public streets and thoroughfares. I trust I may be pardoned for mentioning at this point a lantern which I have had specially made, and which has been used in the lighting of a village near here with most satisfactory results in the saving of mantles. The bottom of the lantern, which is wholly of glass, is provided with a 3-inch opening, over which an additional circular piece of thick glass is used, 5 inches or so in diameter, with a hole in the centre only just large enough to allow the stand-pipe, which is wedged tightly in the column, to pass through. The object is to avoid any jar on the stand-pipe through the lantern swinging against it in windy weather or in lighting and cleaning. I may mention that Simmance and Abady's "Auto" lighting cock arrangement is used with this lantern.

No one would gainsay the brilliancy and intensity of the high-power electric arc lamps, such as you may see in this town; but when cost is considered, and their applicability only for the lighting of open spaces is taken into account, there should be no two opinions as to which, from economical and utilitarian points of view, is the most suitable agent for street lighting. Facts and figures as to the comparative costs of the two illuminants have been scattered broadcast, and are so well known that it is unnecessary for me to weary you with needless repetition of them on this occasion. I find it difficult, however, to leave this subject without adverting again to Mr. Thomas Holgate and his experiments, of which he gave an account at the May meeting of the Institution of Gas Engineers. With a suitable burner having a $\frac{5}{8}$ inch diameter mixing-tube, and consuming hot air and hot gas governed "with exactitude" at a pressure of 1·05 inches, Mr. Holgate obtained a lighting efficiency of 86·4 candles per cubic foot of gas consumed. Surely such a result must realize the dreams of the most prophetic lighting enthusiasts of the present day. And yet we are told by the gentleman who gives us these results that he sees no reason why we should not, with suitable burners, obtain an efficiency of 100 candles per cubic foot. When we contrast the above with the 3½ to 4 candles per cubic foot which the old flat-flame burners gave, we must agree that these results stand out conspicuously as one of the most notorious achievements of modern times in the development of light from coal gas.

The growing use of gas for other purposes than lighting still continues. For cooking and heating, gas holds a unique position. There are very few towns in the kingdom into which the ubiquitous gas-cooker has not found its way; and the readiness with which the public have taken to it, ensures its future position of usefulness. It may be mentioned that in this town, which was one of the first, if not the first, in the United Kingdom to be lit electrically, and in which a large proportion of the better-class houses have adopted the new illuminant, gas is still used in many, probably in most, of those houses for cooking or heating; and I think I am well within the mark when I say that the consumption in such houses is nearly, if not quite, as great as when gas was the illuminant used, and before the introduction of cooking and heating appliances. In comparing the summer consumption of seven years ago with that of the present year in Chelmsford, I find—and it is pleasant to record it—that the output is now nearly double that of the earlier year. This increase is undoubtedly due, in a great measure, to the quantity of gas now used for cooking, and it goes to show that if many of our old lighting consumers have "dissembled their love for us," and even, in some cases, gone to the length of "kicking us downstairs," the majority find us useful to them still. As one lady put it to me not long ago, "If you can't light us, you can cook us!" And we are doing our best in that direction.

Another important field in which the use of gas is extending is that of motive power; and the recent legislation, imposing (under the new Factory Acts) closer and more stringent regulations in the inspection of steam-boilers, should tend rather to the adoption by users of motive power of gas instead of steam for driving machinery of every description. The development of the gas-engine to 500-horse power and upwards is an accomplished fact; and we are told by an experienced authority that "gas-engines of 150 to 200 brake-horse-power, manufactured by any of the well-known makers, can be accepted with the same confidence that you would place in the steam-engine of similar power." A gas-engine possesses many advantages, in convenience, economy, and reliability, as well as in other points, over the steam-engine, all of which are so well known to you that I need only refer casually to them. But there is one use to which the gas-engine might be more extensively put with absolute certainty of success; and I may be excused for drawing your particular attention to it. That is the driving of dynamos for the generation of electric current for lighting. In towns where electricity is already extensively used for lighting business establishments, public buildings, &c., and even for private houses where a considerable number of lights are required, the gas-engine may be employed for generating current; and it will do so at, generally speaking, little more than one-third the cost at which current can be purchased from a central station. Thoroughly reliable engines are now specially made for this purpose by most of the well-known makers. There are, I am given to understand, several private installations working on these lines most successfully in Colchester and Ipswich; while we have some two or three in this district giving, I believe, every satisfaction.

It may be argued that private installations of this character present difficulties and drawbacks in the way of the skilled attention that would be required. But I am speaking of towns in which electric light is established, and is, or is becoming, more or less extensively used; and in such towns there are usually one or more capable electricians engaged in business who would, there is every reason to suppose, be only too glad to make terms for periodical examinations, and to carry out such repairs as might be required and to generally see to the working efficiency of dynamos and plant. Although the foregoing reference to the utility of gas-engines, and the few remarks I have indulged in as to their adaptability for driving dynamos, may be only travelling over ground that has been traversed by others, little apology is needed from me for again bringing the subject to your notice; and I would urge the importance of this outlet for gas among the various ways in which the business of the concerns you are connected with may be increased.

All this brings me to another subject—viz., the qualifications of the gas manager of the future. There has been no little discussion lately as to what course of training the future gas engineer and manager should undergo to fit him for the work he will be expected to carry on. No one will deny that he should be thoroughly versed in all the modern methods of gas production and distribution; and if his opportunities and capacities will admit of it, he should become competent in structural engineering, be technical in all branches of the business to his finger tips, and should be learned in most of the sciences. But this, to my mind, is not all by any means. To make the concern under his charge and care thoroughly sound and successful, he should combine the above qualifications with a close knowledge of business affairs, and be prepared, and ever on the watch, to exercise that knowledge.

I will give one or two instances illustrating the importance in gas-works management of what may be termed "pushfulness." Acting in the capacity of consulting engineer to several small works in the neighbourhood, some of which have within the last few years undergone a change in proprietorship, I have had an opportunity of seeing the effect of what business enterprise will do. I will begin with a works now owned by a gentleman well known to many of you. Five years ago, these works belonged to a private Company, the price of gas was something like 5s. 10d. per 1000 cubic feet, the leakage was high, the feeling locally was high, and the concern was nearly what might be described as a white elephant to the proprietors. The works were purchased by the gentleman referred to, the price of gas was immediately lowered, gas cooking-stoves were introduced, and no opportunity was lost of securing new consumers and of doing everything possible to please them; with the result that the sale of gas has more than doubled, and the concern is now paying not less than 8 per cent. dividend.

In another case, an energetic trading Company took over a business which included a village gas-works with about fifty consumers and an annual loss, although gas was sold at 6s. per 1000 cubic feet. Owing to a careful house-to-house canvass of the district, and the holding of gas exhibitions, in less than twelve months' time this Company have fixed out on hire 30 cooking-stoves and added 20 slot consumers; and, for the first time for very many years, if not in the history of the Company, they are now making a profit.

In both instances the new proprietors were entirely strange to gas-works management; but business methods and energy were brought to bear in these cases in a way which we seldom see in men of our own fraternity, with the result that these small gas undertakings are being developed most satisfactorily. Doubtless many of you are able to recall similar cases. If the principles followed in the instances given are so successful, why should they not be equally so in our larger concerns? There is little doubt in my mind that the average gas manager has in the past neglected greatly the commercial side of gas-works management.

Before concluding my address to you to-day, I feel it incumbent

on me to say a few words about the Chelmsford Gas Company and their works. I will be as brief as possible. The Chelmsford Gas Company is an old-established concern. It was formed in the year 1819—and so was one of the oldest gas-works in the country—"for the purpose of lighting the town of Chelmsford and the hamlet of Montsham and parts adjacent with inflammable air or gas." The works were designed and built by Malam, one of the pioneers of gas lighting. The charge at first was by agreement; there being no meters in use. Meters were introduced in 1828; and the price then charged for gas was 17s. 6d. per 1000 cubic feet. Coal at that time cost £1 12s. 9d. per ton. From time to time extensions and alterations have taken place; but the building first used as a retort-house is still in existence, and bears the date of its erection. It is now used as an auxiliary coal-store.

On the introduction of electric light into the town, and the subsequent loss of the public lighting, the Company experienced a considerable reduction in the sale of gas, so much so as to leave them saddled with a heavy capital account in proportion to the output. It should be mentioned that costly extensions had been carried out immediately before the time referred to. During the last few years, however, the undertaking has taken a decided turn for the better. The business has increased considerably, and it has been deemed necessary during the present summer to increase the storage capacity. This has been effected by telescoping one of the existing holders. One of the most important alterations made at the works was the introduction of regenerative settings and the discarding of the wasteful system previously in use. This work was carried out by our friend, Mr. Smithard, during his management of the works. Another important addition made about the same time was the adoption of a small carburetting plant for enriching the gas after it leaves the governors. I cannot speak too highly of the value and utility of this small and comparatively inexpensive apparatus, by means of which we are enabled, on occasion, to raise the illuminating power of our gas several candles in the space of fifteen or twenty minutes. Various enriching oils have been tried, but for some time now I have kept to a petroleum spirit of about 0·680 sp. gr.

Owing to our being heavily weighted with capital, and to our comparatively small make (about 45 million cubic feet per annum) and also to the price we obtain in this district for coke—viz., 20s. per ton retail in the works (a price some of my Manchester friends would like to enjoy)—I have not seen my way yet to recommend my Directors to introduce water gas. One of our greatest troubles is the cost of conveying coal into the works, particularly the seaborne coal, which is brought up the Chelmer and Blackwater Canal in barges to a point adjacent to some parts of our premises. The cost, however, of unloading the barges and moving the coal over only a very short distance into our works amounts to 10d. per ton. Some day, as our requirements increase, we may take into consideration the adoption of a coal hauling or conveying plant to supersede the light railway we now have. We are, I assure you, alive to the fact that "the times are changing, and we must change with them."

In conclusion, I should like, for the benefit of our visitors to-day more particularly, to say a few words about the Eastern Counties Gas Managers' Association. This Association is one of the youngest in the kingdom, having been formed in 1888, with a membership of only 25. But from the first it was a healthy child, and it has now grown to a position of usefulness which enables it to compare favourably with any institution of its kind. The roll of membership has increased to 90, and it is gratifying to note that the *esprit de corps* which prevails throughout the entire list of members is such as to ensure the carrying on of the Association's good work—for I hope, many years to come—for the benefit, not only of gas engineers and managers, but also of the undertakings with which they are associated.

On the motion of Mr. WIMHURST, seconded by Mr. FRANK PRENTICE (Ipswich), the members thanked the President for his interesting address.

PRESENTATION TO THE LATE SECRETARY AND TREASURER.

The PRESIDENT said the next duty he had to perform was a very pleasant one—far more so than the reading of an Inaugural Address. It was to present to their friend Mr. Troughton a mark of their esteem and gratitude for what he had done for the Association during the years he had occupied the position of Hon. Secretary and Treasurer. They all knew Mr. Troughton's good qualities; so that anything he (the President) could say would not flatter him. He was thoroughly deserving of the little recognition they were about to make, of their best wishes, and of everything good that they could say of him. He (the President) used to think that the secretaryship of a Gas Association was an easy sort of appointment; but latterly, and particularly the last month or two, he had come to the conclusion that there was a great deal more work connected with an Association than he had thought possible. If the members only saw the number of letters he (the President) had received the last month from their Hon. Secretary, besides the great amount of detail work there had been in connection with this meeting, they would agree with him that the success of an Association like theirs depended in large measure upon the energy, method, and life the Secretary threw into his work; and how well their late Secretary had discharged those duties for seven years was fully known to all the members. With these few remarks, he would ask Mr. Troughton to accept a silver tea and coffee service and salver as a small token of the esteem of the members and a few friends of the Association, and as a little recognition of the services he had rendered to the Association during the past seven years. He had also to ask him to accept, on behalf of Mrs. Troughton, a gold bracelet. Expressing the good wishes of the members to both, the President handed the gifts to Mr. Troughton.

The tea and coffee service and salver are of a beautiful ornamental design, and the bracelet is of a novel chain pattern. On the salver is engraved the following inscription: "Presented to Mr. J. H. Troughton by the Eastern Counties Gas Managers' Association, in recognition of valuable services rendered to the Association as Honorary Secretary and Treasurer from 1895 to 1902. 17th Sept., 1902."

Mr. TROUGHTON, who on rising was enthusiastically greeted, said he thanked the members most sincerely for this mark of their appreciation of the services he had been able to render to the Association during the last six or seven years. He could only say that what he had been able to do had been an immense pleasure—it had indeed been more than a pleasure; it had been an education. He had always endeavoured to do the best he could for the Association; and he was proud to think his efforts had met with the approval of the members, and not only so, but that they had been satisfactory so far as the Association was concerned. When he took over the secretaryship from Mr. Wimhurst, the membership was about 65; that day it was 90. In the first days that he held office, the meetings were not nearly so well attended as they were now. For instance, at the meeting he had to arrange first—the one at East Dereham, on April 15, 1896, there were only twelve members present; but the proceedings were successful. The next meeting was held at Retford, when members to the number of seventeen were present. In April, 1897, the meeting was at Peterborough, when the number of members present was 22. Then in the following September they met at Ipswich, under the presidency of Mr. J. T. Jolliffe. There they had a highly successful meeting, with an attendance of 32 members. This was the record for those days. The April meeting in 1898 was again held in Peterborough, when 25 members assembled. Romford was visited for the second meeting that year. There was a falling off in the attendance; but nevertheless the proceedings were, in all other respects, very successful. The first meeting in 1899 was at Cambridge, when 26 members were present. Sleaford was next visited; his predecessor in the secretaryship (Mr. Wimhurst) being the President. On this occasion, there were 16 members in attendance. The first meeting in 1900 was held at Cambridge; the attendance of members rising to 27. The following September, at Spalding, 18 members were present; but in the spring of 1891, meeting at Norwich, there was a jump to 33 members. Twelve months since, at Cambridge, they marked a record, with an attendance of 39 members—Mr. R. Brown being their President. In April of this year, the meeting was at Boston; and then 26 members put in an appearance. During the whole of this period, they had had many interesting and able papers brought before them for discussion, to say nothing of the excellent addresses from their Presidents. With regard to himself, the work he had performed had really been to him a labour of love, and had given to him the greatest possible pleasure; and he could honestly say the members generally had assisted him very materially. Especially would he like to thank the Past-Presidents for their great services to the Association—particularly in aiding him in the arrangements for the various meetings, not only in regard to correspondence, but in looking after the comfort of the members, and in entertaining them similarly to the kind manner that they had experienced that day. On behalf of his wife, and on his own account, he thanked the members and his friends very sincerely indeed for the handsome gifts. They would constantly raise many pleasant recollections of his past six or seven years' work for the Association.

Mr. J. W. RUSSELL WALL (London) read a paper, entitled—

THE "RAPID" CHARGING AND DRAWING APPARATUS.*

Let me at the outset state that it is at the invitation of your worthy President I am here present to read a paper on the subject of charging gas-retorts by means of the patent "Rapid" charging apparatus. It was with diffidence that I agreed to do this, feeling the position in which I would stand in the presence of so many gentlemen with technical knowledge, and also that many of you might naturally have the impression that I was "puffing" a machine in which I am closely interested. I think, however, it will be admitted that my 20 years acquaintance with gas engineers, far and near, has been sufficient to put me in possession of a great deal of knowledge as to their difficulties and requirements; and it will probably be conceded that my one desire has been to discover and introduce something that will benefit the gas industry.

I venture to suggest that in these machines this object has been obtained. The amelioration of the lot of the toiler was one of the characteristics of the closing years of the past century; and at no period of the world's history has the condition of the worker been so carefully looked after by an almost paternal State

* An illustrated description of the latest form of this apparatus was given in the "JOURNAL" for May 21, 1901, p. 1379.

and the considerate employer as during the present decade, until now the conditions of labour are almost paradise, compared with those existing a century ago. To this desirable consummation, the gas industry, though long delayed, has contributed its quota; though contented for many years in continuing the exhausting conditions of labour in the retort-house with the method of stoking inaugurated in Murdoch's day, while other industries were making rapid strides in the production of machinery to lighten their labour. But with the general progress, labour began to feel its power; and the number of men both capable and willing to submit to the trying conditions of the retort-house became a decreasing quantity, and labour troubles ensued.

Then Mr. John West, Mr. William Foulis, and others arose and appreciated the situation. The outcome of their labours may be seen in the admirable machines bearing their names, and which have proved of such incalculable benefit to the gas industry. It soon became apparent, however, that these machines did not completely solve the problem of retort-house labour. From their very completeness, and consequent costliness, they could only find a home in large gas-works; and the engineers of the medium size and small works still longed for a simple and inexpensive machine that would reduce the labour of the retort-house, making it possible for ordinary labourers to perform the duty of stoking, and thus afford relief from the Gas Workers' Union.

Many attempts have been made in this direction; and now we have, in the "Rapid" charging machine, an appliance which has, in the course of several years' experience, been proved to fulfil the conditions of economy, simplicity, and inexpensiveness, while also greatly alleviating the arduous toils of the stoker, Mr. Braithwaite, Engineer of the Wrexham Gas Company, has expressed to us the opinion that humanitarian reasons alone are sufficient to warrant its adoption. I will now endeavour to give a brief description of both the manual and power "Rapid" charging machines, and explain their utility, &c.

The manual machine consists of a winding drum worked by means of a chain and wheel on the same shaft. A steel wire rope or chain (preferably a rope) is attached to the drum, to the lower end of which is fixed a steel loop to carry the scoop. The drum and wheel are in a carriage which travels upon a pair of rails placed parallel to the retorts. The drum is provided with a ratchet, into which a pawl engages, and sustains the load at any required point. The lifting power is transmitted from the hand chain wheel to the drum shaft by means of a patent pawl and ratchet wheel; the latter being rigidly fixed to the shaft. The hand chain wheel is not in any way fixed to the shaft, and, consequently, remains free to revolve in one direction, while the shaft is stationary. The object of this is to relieve the shaft and lifting wheel and drum ratchet of the tremendous strain caused by the sudden action of the drum pawl.

It is obvious that, when a scoop is being lowered, the drum and shaft attain great velocity, which causes considerable impetus to be stored in the large hand chain wheel, which would cause serious damage to the machine were it not for the patented free-wheel device which allows this energy to be gradually spent. This is, therefore, a very important and indispensable feature in the mechanism. Before its introduction, we were troubled with the twisting of the axle and the breaking of the pawl and ratchet, and the bursting of the wheel boss, all of which troubles are now completely obviated without materially increasing the weight of the machine.

A further important feature is the free-wheel patent pawl, which, by its double action, renders it automatic without the aid of any spring. Previously, a single pawl, actuated by a spring, was introduced, but was accompanied by the serious disadvantage of the liability of its being completely put out of action in the event of any mishap occurring to the spring, and thereby putting the lifting gear out of action. The whole of the gear described is self-contained, and travels upon another carriage moving on another set of rails, fixed parallel to, and in front of, the retort-bench, to enable the apparatus to deal with any number of retorts. The entire machine is moved from one bed to another by means of a hand chain.

The process of working the machine is as follows: The scoop being placed in the steel loop on the floor opposite the retort to be charged, is then filled with coal by the two stokers. When the load is ready, one (whom we call the scoop driver) takes the handle of the scoop, while the other (whom we call the chain man) hoists the loaded scoop by means of the hand chain, the scoop driver meanwhile balancing the scoop as it rises. The travelling gear above then carries the loaded scoop into the retort, with little exertion to the scoop driver. The distance of this travel of the overhead gear gives the scoop ample impetus to be carried to the full length of the retort. The scoop is then overturned and withdrawn. We recommend a heavy charge to be made in two scoop fulls, both on account of the ease to the men and the more even distribution of the coal over the floor of the retorts. All the machinery is carried on overhead rails; so that the valuable space on the retort-house floor is not in any degree sacrificed, as is the case with most other stoking machinery.

It is a recognized fact that scoop charging is preferable to shovel charging; and seeing that hand scoop charging necessitates the employment of three men to charge a retort, it will be admitted that if the operation can be performed by two men, there is an advantage. By the means of this simple mechanism, not only can this operation be accomplished by two men, but by one man when the charge is small—say, 2 to 2¼ cwt. I feel sure that the Engineer of the Harlow Gas Company, Essex, would be pleased to allow any gas engineer to view the machine at work, handled by one man only, and would willingly testify to its efficiency. I should have mentioned that the application of a balancing arrangement, and the device for lessening the load on the hand chain, permit of the operation being performed by the one man. At the Goole Gas-Works, there are two "Rapid" machines at work, each handled by two men; and I believe the carbonizing at these works will stand the scrutiny of the ablest gas engineers in the country. I might also point to Normanton, Worthing, Wrexham, and many other places which stand high in point of carbonizing.

With even and regular charges, the holding capacity of a retort is increased, while the carbon deposit is greatly minimized—all conducive to an increased production of gas and greater ease in drawing. It is probable, too, that the carbon deposit is reduced by the constant scarifying effect of the scoop on the retort. In the case of shovel charging, the unevenness of the coal on the floor of the retort prevents the free escape of the gas into the hydraulic main, and allows the formation of carbon. Whether this is so or not, the fact remains that much less carbon is found on the retort, and its life is materially prolonged, which everyone will appreciate is no mean saving. There is economy of gas effected at every charge, on account of the quantity of 1½ or 2 cwt. of coal contained in the scoop being dumped in bulk into the retort, instead of in shovelfuls by the ordinary method. And last, but not least, of all the advantages accruing is the reduction of the arduous and trying labour of the stokers, which is the desire of every wise gas engineer.

Of course, many stokers will not believe that their employers have any desire to lighten their labours, but consider that every invention brought out, or adopted by them, is with a selfish motive. There is no wonder therefore that, in the placing of this machine in gas-works in the first instance, there was opposition displayed on the part of stokers. This fact was the best proof of the success of the machine; and bearing in mind the opposition displayed by the great majority of workmen to all machinery, wherever and whenever installed, I was the more nerved to persevere in introducing it, and determined to fight at all cost such prejudiced notions and actions. It has therefore been my lot, in conjunction with a fairly large gas company, to enter into a deadly combat with the stokers; out of which struggle the company and myself came victorious after five weeks' warfare, thanks to the "Rapid" charging machines, under the able direction of the engineer. It would be interesting to recount some particulars of the struggle we had; but time will not admit. Suffice it to say the machine has proved itself of great value to gas companies in combating the dictatorial policy of prejudiced stokers.

Up to this period, we had done nothing either by supplying stokers to train the men in the use of the machine, or by supplying men in the event of opposition. Since we took the decisive stand at Newport (Mon.), however, we have experienced no opposition whatever; and we now invariably send two of our young men as trainers wherever we fix the machine. A recent instance of a strike terminating far from satisfactorily to the gas company where machinery is not employed, serves to prove the importance of every gas company being in possession of an apparatus which will make them independent and safe from successful attack in their most vulnerable part—the retort-house.

Now let me explain briefly the mechanism of the "Rapid" "power" charging machine, which, actuated by any power on the works, will be specially acceptable to the engineers of large or medium-sized works, and greatly increase the usefulness of the "Rapid" charger. The power machine consists of a travelling framework upon which again travels a carriage with winding drum for lifting the scoop, as described in the manual machine. In place of the hand chain wheel, is fixed a wheel with a V-shaped groove, and on the main plate of the machine is fixed a pinion with grooves corresponding to those on the drum shaft, and in such a position that, when the drum carriage is pulled back as far as it will go, the grooved wheel is brought in contact with the pinion, and then (by a patent device) is drawn tightly into contact therewith. This pinion being kept in rapid motion by means of bevelled wheels and pulley, driven by an endless rope, imparts motion to the drum, and winds the rope or chain which lifts the scoop. By means of a ratchet and pawl on the drum, the load may be sustained at any given point; and at the instant the operator releases the friction gear engaging lever, the scoop ceases to ascend.

To regulate the descent when the pawl is disengaged from the drum, a powerful hand brake is provided, which is worked by the same hand which operates the pawl. For traversing the machine from one retort to another, power is derived from the same endless rope; and, by a series of levers, suitable friction gear is put into motion, and propels the machine in whatever direction the operator desires—the only operation needful being to push a lever in the direction in which the machine is desired to travel.

All the advantages obtained by the manual are secured by the power apparatus, with infinitely less exertion on the part of the stokers and in far speedier time. The results, then, must necessarily be greatly improved. The objection may be made by some that, in the event of the rope becoming broken, or the breakdown of the engine, the apparatus would be brought to a

standstill and shovel charging have to be resorted to. This, of course, would likewise apply to other more complicated apparatus. But even this objection has been anticipated; and we have now devised a combination manual and power apparatus, so that, in the event of the driving rope or engine breaking, the machine can be manipulated as a manual until the repairs are executed. The probability of such mishaps are very remote. In fact, I have a letter before me where an engineer says that he has been using the same rope for seven months, and there is still, as far as he can see, two months' life in it yet. The cost of a rope is a very small matter indeed.

The manual drawing machine, as at present used, simply acts as a rest for the rake, and, consequently, has very little advantage, if any at all. It yet remains for an efficient drawing machine to be devised. This apparatus acting as a support to the rake, and a means of raising the rake to any required retort, must, if to be of any use, also assist the stoker in withdrawing the charge. I am not yet in a position to describe this apparatus, as it is not yet fully protected at the Patent Office, though most of the details are all worked out, not only on paper, but in the actual mechanism. The fact of this not being ready, does not in any way militate against the "Rapid" charging apparatus, seeing that the advantages specified early in the paper are not resultant on the adoption of any drawing apparatus. Even if the drawing apparatus never met with success, the charging machine will still retain the estimation of gas engineers.

Discussion.

The PRESIDENT, in inviting discussion, said he should like to mention that there were some portions of the "Rapid" charging-machines in the entrance-hall; and, at the close of the meeting, the author and Mr. Howard Wall would be pleased to explain their operation to the members.

Mr. W. D. CHILD (Romford) said he thought the apparatus that had been explained to them by Mr. Russell Wall was, to use his own expression, "discovered" by him, because he (Mr. Child) had no doubt that Mr. Wall was not the inventor. It was an apparatus with which gas managers had been familiar long before it was taken up and perfected by Messrs. Biggs, Wall, and Co.; and it was undoubtedly an appliance that was very useful in assisting in the charging of retorts. Mr. Wall, however, claimed for it a superiority over shovel charging; but that he (Mr. Child) was not prepared, as a carbonizer and a gas maker, to admit. If they could have maintained the old style of shovel charger that they had in gas-works many years ago, they would not have had a better means of carbonizing coal, because the old class of intelligent shovel charger could place the coal evenly in retorts, and just where they were at the best heat to bring out the highest results from the coal. Unfortunately, however, gas-works had been handicapped by struggles with labour; and the question had been how best to accomplish the work—how to carry on the work from day to day if the stokers turned rusty and declined to perform their duty. And in this event the apparatus just described to them was very useful. As to whether it was to be preferred to other methods of manual stoking—such as West's machine (to which Mr. Wall had alluded), he hardly knew that one could admit it had a preference. Certainly it should have a claim on the score of first cost—judging from what he had seen of the illustrations of the machine, and his knowledge of work as an engineer. But whether the first cost was everything, was another matter. He did not know that he had seen any of the apparatus that had been supplied by Mr. Wall; but he had seen something similar to it at the Spalding Gas-Works. There he was charmed with the way the work was being performed. But their friend at Spalding had some of the best stokers he (Mr. Child) had seen—active, willing, and intelligent men; and they worked the machine backwards and forwards from the retorts to the coal heaps to get it filled in a way that was quite surprising. In the West manual stoking machine, they had the coal lifted into the framework, and carried direct over the retorts where it was wanted; and all that had to be done to bring the coal down and send it into the retorts was to revolve a handle. No special activity was wanted, and no special strength; and, from his point of view, the West machine had an advantage over the "Rapid." As mentioned by Mr. Wall, there was an advantage that was common to both machines—that was, the regularity of the charges in the retorts. Mr. Wall directed attention to the manual drawing-machine, and said he could not see there was any great advantage in it. But the advantage was obtained from the charging-machine. The regular way in which the charge was deposited in the retorts assisted in the drawing of them. If they could obtain the same regularity by charging with the shovel as was done with either of the machines mentioned, then the drawing would be comparatively easy. It was the regularity and the evenness with which the coal was carried into the retort that enabled it to be drawn out so easily and saved labour in drawing. Both the West machine and the one before them was in this respect an aid to the managers of gas-works; and, for this reason he was glad Mr. Wall had brought the "Rapid" machine more prominently to their notice than it had been before.

Mr. T. GLOVER (Norwich) said some of the members would have enjoyed the paper better, perhaps, if there had been a few diagrams to accompany the written matter. Of all machines used in the retort-house, other than the shovel, this type was the simplest charging-machine they had; but he thought efficiency might suffer for simplicity. No doubt this machine had special claims for small works. He did not know how small, but he supposed any works using retorts at all could use the machine with advantage. But immediately they got to (say) six settings of 10-feet lengths, then it would pay to put in machinery of better type than the simple machine described to them that day. While it had advantages for small works, it still possessed some of the disadvantages of shovel and scoop charging, inasmuch as the coal was about the retort-house floor, in the way of the men who drew the retorts, and in the way of the wheeling out of the coke, which altogether gave a very untidy and wasteful appearance to the house. The great advantage of West's manual and West's and Foulis's power machines was that the coal was stored for immediate use overhead. It was conveyed to the retorts without any of it being dropped about the floor, and was put into them with a minimum of waste. He thought these were very great advantages that must be kept in view. Then they had had very little said about the cost of carbonizing; and they must remember that a good deal of the carbonization work consisted in the drawing. But he did not think what they had had described to them would assist very much in the drawing. If they analyzed the cost of carbonization, it would be found that the drawing of the retorts formed a very high percentage of the cost. A machine running on rails in front of the retorts, and carrying a heavy rake for drawing out the charge in about three pulls, had great advantages, and operated in reducing cost very materially. Therefore the conclusion he should arrive at would be in advising any works with not less than six beds of retorts as a minimum, to use machinery of rather better class—though it would cost possibly more in the first place—in order to secure the better results.

The PRESIDENT said he thought the apparatus that had been explained to them was very applicable to small gas-works. He was not sure, however, that scoop charging had a very great advantage over shovel charging, providing they had decent shovel chargers. In the North of England, before coming South, he scarcely saw a hand-driven scoop in use. They felt in those days in the North that the best form and method of carbonizing was by shovel charging. There was another important consideration in favour of the "Rapid" charging apparatus; and it was that, in order to adopt machines of the West and Foulis types, considerable alteration to most existing retort-houses would be required. In his case, they could not adopt the West or Foulis method of charging and drawing retorts without raising their retort-house roof very considerably; and this should be taken into account when considering the cost of the various systems.

Mr. FRANK PRENTICE (Ipswich) said there was one question he should like to ask, and it had reference to what the author described as the power charger. What he wished to know was whether the machine pushed the scoop of coal into the retort and returned the scoop, or did the machine simply lift the scoop from the ground to the right height.

Mr. RUSSELL WALL said he would first of all reply to Mr. Child, who said the machine had been at work before his firm brought this one out. He (Mr. Wall) would like him to name a works in which it had been used. He would admit that a machine somewhat after the same idea had been employed, but not for carrying the scoop into the retort, which this machine did. There was all the difference. In the old style of machine there was a central rail running from one side of the retort-house to the other, parallel to the retort-benches, and the scoop was lifted by means of a pulley-block. But then the stoker had to do all the work of pushing the scoop into the retort. In the case of the "Rapid" machine, the scoop was carried into the retort without any trouble to the stoker. He had never seen the machine, which he had had mentioned to him several times; and he did not even know where it was to be seen. Then, as to Mr. Child's reference to shovel chargers. By the aid of the "Rapid" machine, ordinary labourers could be employed, and skilled shovel chargers be dispensed with; and that it accomplished its work was shown by the fact that at Newport (Mon.), where 50 stokers were employed, they successfully combated the Stokers' Union, with disastrous results to the latter. The men they took down to the works were not the best in London, and some of them had never been in a gas-works before. These men readily charged and drew the retorts; and some of them were in the same works now. This, it must be admitted, spoke well for the charging-machine. He might mention another works where machinery was not in operation; and the results there were disastrous to the gas industry. He had letters from this gas-works, asking him to take on the strike; but they wanted him to guarantee to defeat the Union in so many weeks. This he refused to do, seeing that his machines were not fixed at the works. He did not think he had spoken disparagingly of West's and Foulis's machines. He thought he said these machines were splendid ones, but that they did not suit the works to which the "Rapid" machine was more applicable. It would not be advisable for small gas-works to go to an expense of £1800 or £3000 for the erection of a charging-machine. It would not pay when a machine of the sort that he had described could be purchased for £150 to do the same thing. It would, in his opinion, be ridiculous to go to such an expense. The President also spoke about scoop *versus* shovel charging. There, again, it was a question of skilled against ordinary labour, which was a great thing. As to the cost of carbonization, he had a letter from a certain gas engineer, in which he told him what he had saved by the machines. It was to the effect that the

carbonizing charges had been reduced fully ½d. per 1000 cubic feet, although no difference had been made in the number of hands employed. The coke was also much better; and his correspondent said that he had had no difficulty in placing it at 1s. above the price they obtained before the introduction of the machines—due entirely to the improved quality. The letters he (Mr. Wall) had received agreed in the main on this question of cost; and he did not think any gas engineer would suggest the writers were in collusion with him. They were all men whom he did not know before he brought out the machine. As to the power machine, the power was relative to the lifting and the travelling—not to the filling of the scoop, which was an easy matter. It was the erection of the coal elevating and transmitting plant that involved so much money in other systems, and this was where the money went. He thanked the members for their criticisms, which he welcomed; his idea being that he should use every criticism in enabling him to bring the machine to a state of perfection.

Mr. CHILD said there was one other thing he should like to say. When he made the statement that the apparatus was already well known, he spoke in perfect good faith; and he should be glad to hear from Mr. Wall where the difference actually was between the apparatus he had described and that which was well known to the gas world for many years—that was to say, the difference between a single rail running parallel to the retort-bench, with a pulley to lift the scoop to the height required to put it into the retort, and the double-rail system that Mr. Wall had, with pulleys still employed to lift the scoop to the height of the retort.

Mr. RUSSELL WALL, in reply, stated that there was a world of difference, which he would easily explain, and which would be most easily understood by every member of the Association. In the "Rapid" machine, there was an overhead travelling drum carriage (as fully explained in the paper), which carried the scoop right into the retort; and when withdrawn, the scoop was dropped instantaneously by touching a lever, which put the releasing gear into action. Whereas, in the primitive arrangement of the single-rail pulley block mentioned by Mr. Child, the stoker's labour was made exceedingly heavy, and was the means of causing difficulties with men rather than avoiding them. When the scoop was withdrawn, the empty scoop had still to be lowered by the pulley block, which operation would take considerable time and entail a lot of unnecessarily hard labour, which was one of the objects the "Rapid" machine was devised to avoid. If this explanation was not plain enough, he invited members to go to the various gas-works where the manual or power "Rapid" machines were installed; and there it would be plainly demonstrated that the immense saving in time and labour claimed was attained. Or, by inspecting the machines on view in the entrance hall, the members would be able to form a good idea of the mode of working, and thus get visible proof of the explanation given.

Mr. CHILD proposed a vote of thanks to Mr. Wall for reading the paper, remarking that the members were glad of any information that would render the operations of their works easier than they were. The Secretary complained of a dearth of papers; but he thought if they adopted the course followed that day, and asked manufacturers of appliances to give them the benefit of their inventions, there would be no shortness of papers. They could, in fact, have as many as they chose to admit.

Mr. F. SMALLBONE (Woodford) seconded the motion, which was unanimously adopted.

Mr. WALL made suitable acknowledgment.

PLACE OF NEXT MEETING.

Mr. WIMHURST proposed, and Mr. BARTON seconded, that the next meeting be held at King's Lynn.

Mr. E. G. SMITHARD said he should be pleased to see the Association at King's Lynn; and he would do all he could to make the visit as enjoyable and interesting as possible.

The motion was unanimously carried.

AN OFFICIAL WELCOME.

Mr. F. A. WELLS, the Deputy Mayor, said he should like to say, before the meeting ended, that it was with very great regret that the Mayor was unable to be present that day. They must, however, allow him (Mr. Wells) to very feebly take his Worship's place and bid the Association a hearty welcome to Chelmsford. He was told that this was the first time they had had the honour of seeing the Association there; and he said, without hesitation, that he hoped it would not be the last time.

VISITS AND DINNER.

The members spent some little time in examining the parts of the "Rapid" charging apparatus that had been fixed in the entrance hall, and then they walked to Bishop's Hall, the residence of Mr. Andrew Durrant (one of the Gas Company's Directors), where they were photographed. After a brief stay for this purpose, they proceeded to the magnificent new works of Hoffmann's Manufacturing Company, Limited, where ball-bearings, balls, and all such parts for cycles and other machines and carriages are made. From these works, several of the party had a short drive through Broomfield and Springfield—districts within the supply area of the Gas Company.

On returning to Chelmsford, the members, with several friends, dined at the Saracen's Head Hotel.

INCLINED RETORTS AT THE VAISE (LYONS) GAS-WORKS.

By M. GODINET, of Lyons.

[A Paper read before the Societé Technique du Gaz en France.]

After the renewal of the gas agreements with the town of Lyons at the end of 1897, and following upon the consequent reduction in the price of gas, rather large increases in the output from the Vaise Gas-Works necessitated extending the producing power. This was decided upon at the beginning of 1900. During the intervening years, I was greatly interested in visiting the inclined retorts at Milan, Trieste, Vienna, Geneva, Zurich, and Basle; and I also saw charging and drawing machines at work at Milan and Vienna. Much impressed by the progress shown, as well as by the economy made, with these systems, I was persuaded that, for new works of any importance, inclined retorts gave the best results as regards saving in labour; and, at the same time, I was certain that they alone could ensure, even with an altogether new and inexperienced staff, the production of gas in case of strikes, as was demonstrated at Milan last winter.

Now, at Lyons the retort-house labour is very dear. The carrying of the coal from the stores to the benches, the charging of the retorts, the drawing and quenching of the coke, cost at least 4 frs. per ton of coal carbonized. At the Vaise Gas-Works, the price per ton was even higher by about 10 per cent., because the nature of the coal, and particularly the sizes of the horizontal retorts, did not allow of as large a quantity being carbonized as in the arches of the Lyons Gas Company, and because, notwithstanding that the work was less, the stokers had to be paid at the same rate. In examining the plans for enlarging the works, we had to take into account that the existing direct-fired arches were very old, that the house which covered them was too narrow to put in arches with retorts of sufficient length, and that the site disposable in the works was restricted. We had, therefore, to lay it out very carefully, as considerable increases in the future were to be anticipated, such as often arise in a works supplying at a very low price a large but poorly inhabited district, but where, nevertheless, the population is continually growing. At the same time that the old arches had to be increased, we found also that the condensation, exhausting, and scrubbing of the gas had become insufficient, and that it was necessary to reorganize entirely another part of the works so as to cope with future developments. We have, therefore, gone into the complete enlarging of the works on the existing land, so as to be able to make as much gas as possible by the most economical means; and we have succeeded in ensuring a daily make of 25,000 cubic metres (882,500 cubic feet) of gas, on about 10,000 square metres of land. We submitted our scheme to M. P. de Lachomette, Managing Director of the Vaise Gas Company, who examined it in detail, and in May, 1900, authorized part of it to be carried out. The following is a description of the scheme, which the engravings appearing on p. 819 will serve to illustrate.

The inclined retort-house will contain, when it is completed, two benches, each of six arches of nine inclined retorts, placed end to end in a building 59·80 m. long inside, and 11·20 m. wide, in between the walls. These benches are separated by a space of 5·50 m. between their end walls. For a commencement, only one of the two benches and the arch of the first bed of the second bench were built; this arch serving for the time being to support the different floors. The building was erected only 40 m. long, in order to leave some sheds which exist on the site intended for the completion of the house; the sheds being at present used for storing coal. This store will have to disappear when the house has to be finished; but all along the retort-house a new store, either mechanically equipped or not, will be made in a space partly occupied by the old retort-arches, which will then be pulled down. This store, which will have a surface of 1800 square metres, will be able to contain the necessary stock for a daily make of 25,000 cubic metres of gas during two months.

Though such units are rather big for the actual make (which is at the most 11,000 to 12,000 cubic metres per day during the winter), we decided upon arches of nine retorts, because a bench of such arches takes up a little less space and costs a little less than a bench of arches of six retorts for the same production. We adopted retorts 3·52 m. long on the incline, or 3 m. on the horizontal line, face to face, rather than longer ones, so as not to increase the power of the unit, already large for our requirements. We chose for the retorts inside dimensions of 62 cm. wide at the bottom, 59 cm. wide at the top, with a uniform height of 38 cm., thus approaching more what is done in England than what is seen in Germany, because these dimensions deviate less from those of our ordinary retorts of 65 by 35 cm. or 64 by 36 cm., the type of the Paris Gas Company, which have always given the best results everywhere. The section of our retorts is of Ω shape. Both the top and bottom retort-mouthpieces have self-sealing lids. Each arch has a separate hydraulic main. Among the different angles with the horizon, for inclined retorts—31°, 32°, or 33°—that are variously adopted, we preferred that of 32°, which seemed to us the most suitable for our coals, which are often very small. With an angle of 33°, there would have been

greater tendency for the coal to slip to the bottom of the retort during the charging. Lastly, we gave to the arching of our beds a width between the upright piers of 3 m., and to the piers a thickness of 75 cm. The end walls, held by strong buckstays, are 1·375 m. thick; and the whole bench of six arches is 24·50 m. long inside the buckstays. These arches, which were built by MM. P. de Lachomette, Villiers, and Cie., have the well-known producers and regenerators of this firm.

The land at Vaise is bad, and water is found too near the surface of the ground for there to be much discussion as to whether we should put the producers above or under the ground level. They are above the ground; but, even under more favourable conditions, I think producers above ground are to be preferred, because they do not cost more in building (for it is practically no dearer to elevate coal 13 m. high instead of 10 m.), and because the work on the producers is done in full daylight and is more healthy for the men. The work is also carried on in a less heated atmosphere, the superintendence is better, there is no need to elevate the clinker, and the coke is more easily carried by conveyors to coke-screens from the first stage-floor than from the yard level. The reason why we preferred placing the producers at the back of the arches instead of under the drawing-stage—where it would have been easier to feed them directly with the hot coke coming from the retorts—was on account of the De Brouwer conveyors. We feared, in fact, leakage of water into the producers, such as successive expansion and contraction seemed to us likely to produce; and, in addition, we thought that the return chain of the De Brouwer conveyor was better placed under the flooring than overhead, where it impedes the mounting and dismounting of the ascension-pipes of arches undergoing repair. The drawback of the producer being at the back is that it is necessary to carry to it the coke for fuel; but we have already the De Brouwer conveyor, which can carry the coke at very little expense—thus illustrating once more that it is a valuable auxiliary. We have summarized the reasons that led us to choose certain arrangements. It is obvious that there is nothing definite about them, and that, moreover, according to circumstances, it might be advantageous to do otherwise.

The drawing-stage and that for the producers, both being 3·20 m. from the ground, are connected together at the two ends of the bench, access being gained by ladders. Then by other ladders, the charging stage, which is raised 5·70 m. from the ground, is reached. Above this stage, and all along the bench, are the coal-tanks, which contain about 8 to 9 tons of coal per arch—that is, very nearly the quantity to be carbonized per 24 hours. The coal passes from these storage-tanks into the retorts by means of charging-shoots—that is to say, by three movable skips on a mono-rail. The skips are filled by valves placed under the tanks, and are emptied direct into the retorts. The height of these charging-shoots is arranged so that one of them serves all the retorts on the same horizontal line. Above the coal-tanks, just mentioned, is a push-plate conveyor for carrying and spreading the coal. To effect this, the trough, in which the plates push the coal, is made with holes, which can be opened or shut as desired, so that the coal can fall where required.

For the purpose of feding this horizontal conveyor (and later on, when we have twelve arches, the two conveyors), we have put up two elevators, with two crushers, which latter were supplied by the firm of Brenier-Neyret, of Grenoble. These breakers are of the type known as jaw-breakers, which we prefer to the others on account of their great strength. It is, of course, important that these machines are not damaged by the passing of the largest pieces which are met with in the coals for carbonization. The object of the breakers is to break the largest pieces of coal which would prevent the charging of the retorts, and which, still further, would damage the elevators and conveyors which they have to pass along. The space between the jaws of the breakers is arranged so that no piece will, on passing through them, be larger than about the size of the fist. There are sieves, formed of bars distanced about 5 cm., which will allow the small coal to be elevated direct; while only the pieces which do not pass tbrough the grill go to the breakers, so as to mix with the smaller coal at the foot of the elevator. Each breaker can deal with 7 to 8 tons per hour; while the elevators and conveyors are each made to handle 15 tons per hour. This difference is accounted for by the fact that we never have in our coals a large proportion of lumps. The elevators are made up of buckets on chains, slightly inclined, and enclosed in a sheet-iron casing. They are 17 m. high from the boot, which is supported at the bottom of a pit 2·60 m. below the ground, up to the top, which rises a little above the horizontal conveyors. These two elevators are placed side by side, receiving the coal at the same point, and delivering it at the same place. They are interchangeable; one only being enough for the work to be done, while the other is in reserve. The duplication of this part of the installation was, perhaps, an excess of prudence or of fear on our part; but we did not wish to risk finding ourselves without coal, because of any damage to a breaker or an elevator. Now, however, that we know our apparatus, the good working of which has given us confidence, we think that a single breaker, and a single elevator would be sufficient for an installation like that at Vaise.

The quenching and elevating of the coke outside the retort-house are done by De Brouwer conveyors of the Cie. Continentale des Compteurs. The plant consists of hot-coke conveyors along each bench, each travelling in opposite directions, bringing the coke between the two benches. There the coke falls into a conveyor at right angles to the two others, which carries the coke from the building and elevates it 7·90 m. above the ground, so as to throw it into the hopper of the coke-breaker and the screen. It is the return chain of this last conveyor which carries the coke for heating the furnaces; delivering it into skips, which take it to the producers. This means of utilizing the conveyor is a happy idea of our colleague M. Lacaze, the Engineer of the Compagnie Continentale des Compteurs. Lastly, the installation is completed by coke-bunkers, which are placed below the coke-breaker and the screen. Their inclined bottoms are arranged with flap-doors, which discharge the coke at 1·30 m. above the ground, so as to facilitate its being put into sacks. The coke-tanks contain about 20 to 25 tons, or 600 hectolitres, of coke, divided into different classes. This allows of storing, very nearly, the coke of twelve hours at night, reckoning the carbonization of about 100 tons per day, and leaving about 50 tons of coke sold. Further arrangements have been made so that, when required, the coke can be taken away from the outside of the tanks when these are full. At present, as we are working with only one bench, and that even not fully in work, the coke service is very easily done; but later on, when we reach the make of 25,000 cubic metres (882,500 cubic feet), we shall certainly regret the lack of space which made us so limit our coke-tanks.

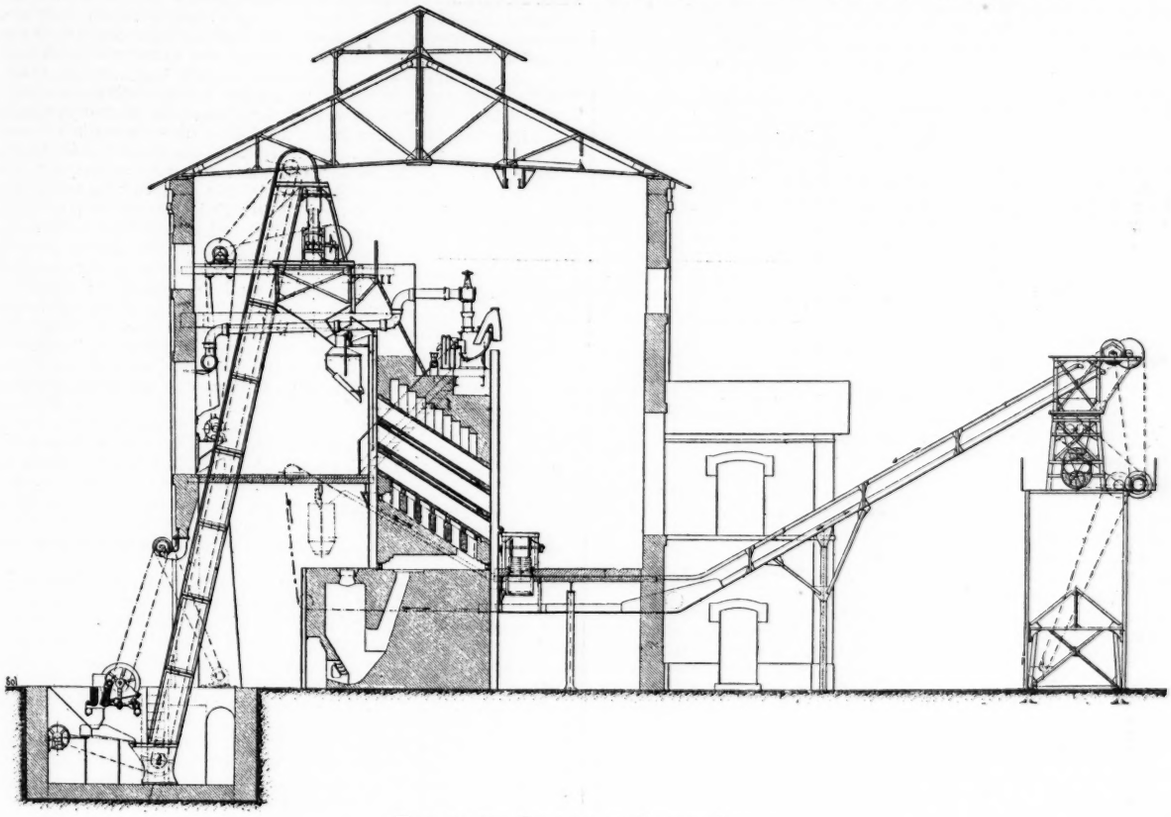
The mechanical handling of coal and coke necessitates, of course, motive power, which we get from the Société des Forces Motrices du Rhône (Jonage), who supply us with the necessary electrical energy at 110 volts. We have at the Vaise Gas-Works seven electrical motors, giving altogether more than 50-horse power, and the rate at which we pay, reckoned by a power meter, is 0·102 fr. per kilowatt-hour of current consumed. In case of interruption in the distribution cables of Jonage (which chiefly occurs when work is to be done on the electrical cables, or when there is any fusing), we have put into the works a triphased alternator at 50 periods and 110 volts, which is driven by a steam-engine placed in the new exhauster-room. In case of outside interruption, the boiler-furnace is lighted, the engine started running, and we produce our own current. We often work with our own energy, as we are doing at present, when we have so much coke-dust to get rid of. Under these circumstances, the net cost of our energy, with a boiler heated by dust-fuel, does not exceed that which we pay to Jonage. It should be stated, however, that this does not necessitate any extra labour, because it is the mechanic for the exhausters who does the stoking for the boiler when it is at work. To drive the retort-house plant which we have mentioned, we have the following motors. One motor of 5-horse power for the breakers. One motor of 10-horse power for the elevators, and one in reserve for the same work. One motor of 3-horse power for the conveyor, parallel to the arches. One motor of 7½-horse power for the screen and for the De Brouwer conveyor, going from the arches to the screening plant. All these motors revolve at about 1000 revolutions per minute. The largest motors have rheostats, and are rather too strong than too weak.

The work of construction was commenced in the month of June, 1900; and, after being interrupted during the following winter, it was continued in the spring of 1901. But it has several times been suspended since that date, so that all our efforts might be given to the extension of the exhauster-house and the condensing and washing plant, which it was necessary to finish more quickly. It was thus not until the end of November, 1901, that we were absolutely ready to light up our inclined retorts.

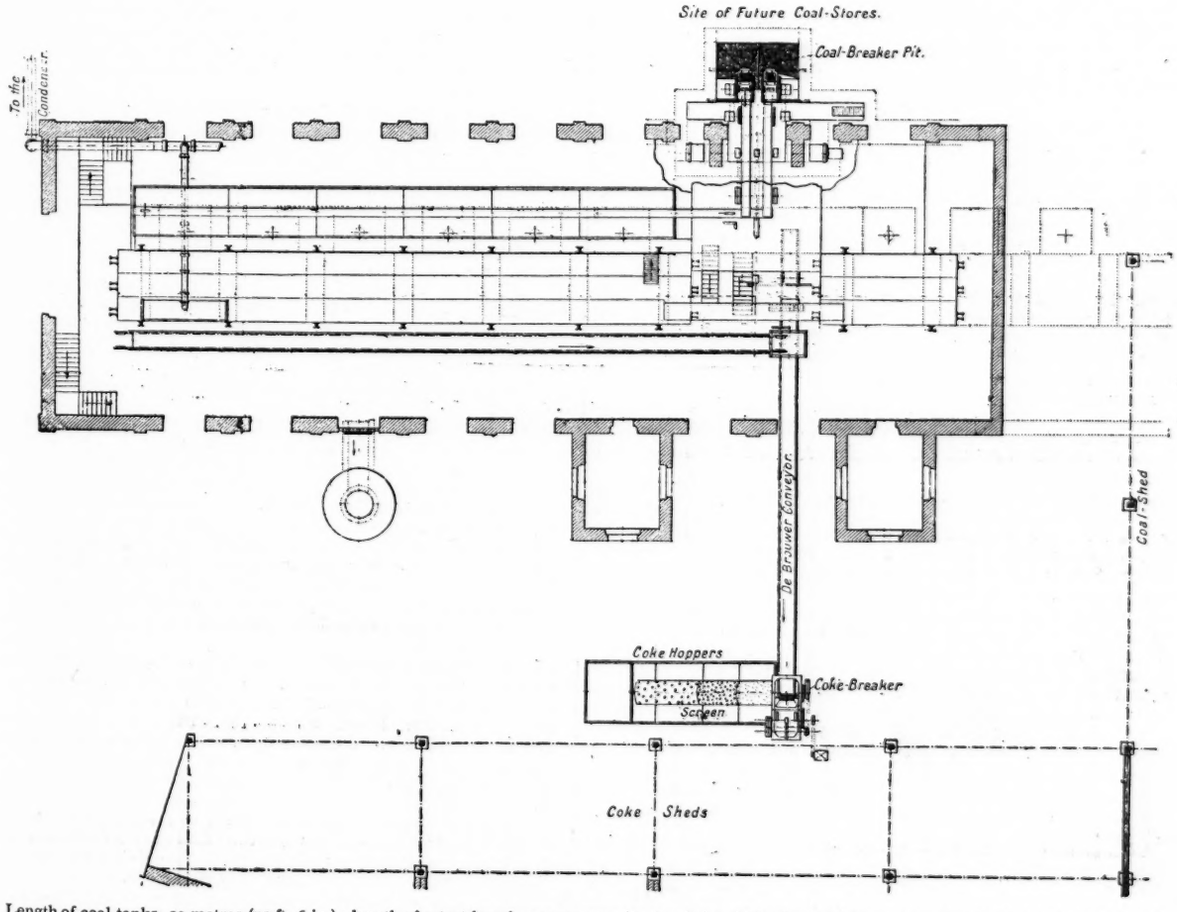
For a fortnight we had a small fire in the producers of six arches of inclined retorts, for the purpose of drying them; and we put the first arch into actual work on Dec. 2, 1901, the second on Dec. 6, the third on Dec. 8, and, lastly, the fourth on Jan. 10, 1902. During this lighting up, the arches of horizontal retorts were working with our usual staff to make up what gas was required; and the work on the inclined retorts was done with an entirely new staff of labourers, divided into two squads, one for day and the other for night. Everything passed off without any difficulty. Time was, of course, necessary for regulating the settings to a suitable temperature, to find out what were the best quantities of coal to be carbonized per retort and per charge; in a word, to understand the new plant that we had in our hands. This period passed, not without need of thought, nor without some anxiety for those of us who had originated this installation, but without any disagreeable surprises, or without any difficulty on the part of the new staff. Then, when at the end of three weeks the stokers from the horizontal retorts were put to work on the inclined retorts, all was absolutely in order, and the work was carried on very easily.

During the first four weeks, we began by carbonizing, in 4 h. 48 min., charges averaging 185 to 190 kilos. per retort (say, 3 cwt. 2 qrs. 16 lbs. to 3 cwt. 3 qrs.), which gave us about 8¼ tons per day and per arch, or with four arches alight about 34 tons. The coals that we were carbonizing then were mixtures of very small and small, Montrambert, which came from uncovered stores, and which were extremely wet. The charging of these small and wet coals was managed very easily in the retorts of the middle vertical tier, which, being heated on both sides, were very hot, so that we could put in more than 200 kilos (nearly 4 cwt.). On the other hand, it was less easy to arrange uniform and well-charged layers with fine and wet coal in adjacent retorts rather less hot, where we only put in 180 kilos (3 cwt. 2 qrs. 5 lbs.). The thickness

INSTALLATION OF INCLINED RETORTS AT THE VAISE (LYONS) GAS-WORKS.



TRANSVERSE SECTION OF RETORT-BENCH.



Length of coal-tanks, 23 metres (75 ft. 6 in.); length of retort-bench, 24·5 metres (80 ft. 4 in.); width of retort-house, 13 metres (42 ft. 8 in.); total length of building, 41 metres (134 ft. 6 in.); total length for two benches of six arches, 61 metres (200 feet).

PLAN OF RETORT-HOUSE.

of the layer being less, it was also more difficult to secure the good spread of it. When any unevenness was found, the thick part of the charge was incompletely carbonized; and this was prejudicial to the make of gas, to the discharging, and to the making of coke. In fact, the unburnt-off parts made large quantities of dust.

During this time of working with 4 h. 48 min. charges, the coke used for heating the furnaces was about 19 to 20 per cent. of the weight of coal carbonized. The coke was that which was produced from the carbonization of our coals; and it contained from 18 to 20 per cent. of ash. We burnt, therefore, about 16 kilos. of pure coke per 100 kilos. of coal. We had very good heats; and they were very uniformly distributed. Our charges in the middle vertical tier were well burnt off; but in the other retorts, where the charges were light, we had too much heat, and where they were heavy, not enough for a large make of gas. It is difficult to get light charges regular with very small coal; but much easier with average lumps, of which we have but a small amount in the coals we carbonize.

Seeing that the heavy charges were always better distributed than the light ones, on Jan. 20, when our make fell off, we changed the working from 4 h. 48 min. to 6 hours; and instead of carbonizing an average of 185 to 190 kilos. per retort, we had an average charge of 205 or 210 kilos. putting 220 kilos. into the middle vertical tier of retorts, and about 200 kilos. in the others. The charges since that time have been much more regular, the carbonization much better, the make of gas excellent for our coals, and the coke much less friable—giving after the De Brouwer conveyor, 9½ per cent. of dust instead of 14 per cent. Our fuel, also, since then has not exceeded 18 per cent. of the coal carbonized (always using coke with 18 or 20 per cent. of ash); and we are burning, therefore, 15½ kilos. of pure coke per 100 kilos. of coal carbonized. The coke that we put into the producers is just as it comes from the De Brouwer conveyor before screening, and contains about 9 to 10 per cent. of dust. We carbonize, therefore, 100 kilos. of coal with 16·2 kilos. of coke and 1·8 kilos. of dust, including ash. If we compare these fuel and carbonizing results with those of settings of horizontal retorts, we find the following differences.

To carbonize 100 kilos. of coal with our inclined retorts, we expend 1½ to 2 kilos. of coke more than with back-to-back arches with horizontal retorts, with producers and regenerators on the same system, using the same coal and coke. This is explained by comparing the cooling surfaces of the horizontal settings with those of the inclined; the surfaces being much greater with the latter. The influence of cooled surfaces has been brought into prominent notice by M. Euchène, the Engineer of the Paris Gas Company, in his paper* to the International Gas Congress of 1900. The proportional importance of cooled surface is, moreover, much greater as the retorts become shorter; and our retorts are only 3·52 m. (11 ft. 6½ in.) long. With retorts 4·85 m., and *à fortiori* with retorts 6·10 m. (20 feet) long, as almost entirely adopted in England, this cooled surface is proportionally less, and less fuel is used. Therefore, it is important to have the retorts as long as possible within practical limits; this length being determined by the importance of the unit for lighting up and letting down. If we compare the quantities of coal carbonized in our inclined retorts and in the horizontal retorts (with producers and regenerators) of our Vaise Gas-Works, the advantage lies altogether with the inclined retorts. But that is due, as before remarked, to our old bench at Vaise having retorts of big section, narrow but very high, in which, under pain of making thick tar and stopping everything up, we had to put in very heavy charges, taking a long time to carbonize, and giving, upon the whole, a small make per retort per day. But if we make this comparison of the charges in inclined retorts, either with those of horizontal retorts in our other works carbonizing the same coal, or with those of the Lyons Gas Company, we shall see that the results are about the same, and even a little better.

Thus, in these horizontal settings, the retorts have inside dimensions of 2·85 m. in length by 0·65 m. in width, by 0·35 m. in height. The horizontal floor of each retort is 2·85 m. by 0·65 m. = 1·85 m². The actual floor in working, deducting a length of 0·15 m. from the retort-mouthpiece, is 2·70 m. by 0·65 m. = 1·75 m². Now these retorts can carbonize per day, with six-hour charges, 180 kilos. × 4 = 720 kilos.—that is, 4·10 kilos. per square decimetre per 24 hours, or with 4 h. 48 min. charges 160 kilos. × 5 = 800 kilos., or 4·60 kilos. per square decimetre per 24 hours. The inclined retorts under consideration have inside dimensions of 3·52 m. in length by 0·61 m. in average width, by 0·38 m. in height. The floor of the retort is 3·52 m. by 0·61 m. = 2·14 m². The actual floor, deducting 0·15 m. at both ends, is 3·22 m. by 0·61 m. = 1·97 m². These retorts carbonize per day, with six-hour charges, 207½ kilos. × 4 = 830 kilos.—that is, 4·20 kilos. per square decimetre per 24 hours, or, with 4 h. 48 min. charges, 185 kilos. × 5 = 925 kilos., or 4·70 kilos. per square decimetre per 24 hours.

We are speaking now of small and very small coal from the Montrambert mines; and in this connection, we beg to make a short digression on the difficulties, more or less considerable, that there are in carbonizing certain coals from different districts. We have in the works controlled by M. de Lachomette about forty settings with producers and regenerators, which are on the same system and of the same power. Several of our works carbonize coals of different qualities and from different districts. We have some works supplied with Loire and Commentry coals, others with Loire and Blanzy, or Loire and Saar, or Commentry and Pas-de-Calais, or, lastly, Pas-de-Calais and English coals. We do not have in these works any great difference in the duration of the carbonization of a similar charge of coal, except where coals from the Loire are being used, in which case the time of carbonization is much longer. In fact, in those works which sometimes carbonize coals from the Loire and at other times Commentry, Blanzy, or Saar coals, the last three named are always carbonized in 4 hours, while with Loire coals it is difficult to exceed five charges per 24 hours—at least, without greatly reducing the charge. It is for this reason that in all the district supplied by mines from the Loire basin the length of time required for carbonization is longer than in works using the other kinds of coal mentioned. I have, therefore, drawn your attention to the character and origin of the coals which we carbonize at Vaise in this comparison we are making between inclined and horizontal retorts. With coals from the Loire, the latter retorts have a less daily make per retort than with other coals. In the same way, the inclined retorts produce less gas with them than they do with coals from other districts. This fact is well known in Switzerland. For example, the Stettiner Chamotte Fabrik Company have built, both at Geneva and at Zurich, arches of nine inclined retorts of the same type and the same power, and absolutely the same in every respect. These arches have a much greater output at Zurich, where they carbonize Saar and Ruhr coals in 4 hours or 4 h. 48 min., than at Geneva, where they carbonize Montrambert coals.

It is also necessary to note that coals hard to carbonize require more fuel for heating the furnaces than easy ones. M. Weiss, the Manager of the Zurich Gas-Works, was astonished at the high temperature of our settings. He assured us that his were much less hot, and that, for carbonizing in 4 hours, they did not have as much heat as we had then for 6-hour charges. All this shows that the results we have obtained with our settings, and with the coals we use coming from the Loire, would be improved, both as regards the make and the fuel used, if we could carbonize other coals. We should state that for some time we have mixed our Loire coals with about 25 per cent. of those from Saar. Unfortunately, these are also small coals—that is to say, of all coals those which lend themselves least to automatic charging in thin and even layers, such as we wish to obtain, so as to increase the power of our arches, and to reduce the fuel expenditure, and to improve our working. We notice, indeed, that each time the proportion of nuts is increased, everything is improved, and the time required for carbonizing a given quantity of coal is diminished, thus confirming the experience of our colleague, M. Verdier, of Marseilles.*

You know that one of the principal criticisms that has been made against inclined retorts is precisely this difficulty of charging them properly with small coal. It is said, also, that the coals run or slip to the bottom of the retorts. This was pointed out to us two or three years ago by our colleague at Geneva, M. Des Gouttes, who told us at the same time of the remedy for it, which consisted in slightly wetting such coals, as fine dry coals run more than when wet. As we started our inclined retorts during the wet season, and as, except at the beginning, we have regularly taken our coals from the yard, and mixed them with other coals coming from covered stores, we have not suffered from this inconvenience. But we shall add during the summer the small quantity of water required, if our coals are too dry, and if this trouble is experienced. It is, in any case, very slight, for we have worked for five months with very small coal without being troubled.

We have still to mention the illuminating power which has been noticeably improved, notwithstanding the largely increased make. We do not know the exact reason for this improvement in the lighting power of the gas, and question whether it is entirely caused by the inclined retorts, though, however, the carbonization is more equal, and the working more regular in every way with the inclined retorts than with the old ones, in which the charges were more frequently irregular. This surely accounts for something; but we think that another reason for the raising of the illuminating power is to be found in the condensation, which is now normal, while before both that and the washing appliances were insufficient.

Lastly, so as to complete what relates to carbonization, we must add that our idea is that the mechanical handling of coal and coke avoids an appreciable fraction of the loss sustained when these materials are conveyed by hand. Thus the losses of coal at charging are reduced, and losses of coke-dust in the yard no longer exist. We may infer from this that the economy arising either from the better make or from the better quality (as we no longer have to enrich the gas), or from the reduction of coal and coke losses, largely compensates for the excess of fuel, even if it was 2 kilos. of coke per 100 kilos. of coal carbonized; so that in this department of carbonization, which we did not think of improving, we have been agreeably surprised.

Indeed, our only aim in proposing inclined retorts was to reduce the cost of the labour. This has been fully accomplished.

* See "JOURNAL," Vol. LXXVI., p. 1080.

* See "JOURNAL," Vol. LXXVIII., p. 340.

In fact, when we gave up the horizontal retorts for the inclined, we had sixteen stokers on the former, and we kept only eight of them for the inclined retorts. The number of special labourers employed in connection with the retort-house, either for bringing the coal from the stores or for quenching and taking away the coke, was at once reduced. During the first three months of 1902, we made an economy of 39 per cent. on the total labour—on the arches and on the coal and coke services, including the receiving and heaping up of the coal. If we reckon the saving on retort-house labour only, it amounts to 46½ per cent. It is further to be remarked that, during the month of January and the beginning of February, we still had two horizontal settings alight. These worked fairly regularly for about twenty days, and the labour on them has not been deducted. Also, throughout the quarter, as our special conveying plant was not finished, all the coke for the producers had to be lifted up to the first floor by labourers. If these expenses were taken off, our retort-house economy would exceed 50 per cent. We have had four arches lighted up, attended by four men in each squad, as follows: One for the producers, one on the charging stage, and two on the drawing-stage and attending to the conveyors. The men change their work every week, the man attending to the producers passing to the charging and then to the drawing. When we let out an arch, we do not alter the number of the men, who, moreover, are enough for the working of the whole bench with its six arches alight.

The working arrangements are as follows: Each producer is thoroughly clinkered every six days, with a slight clinkering every six hours. The producers are also charged every six hours, at 6 o'clock and at noon, and clinkered at 9 o'clock and at 3 o'clock; the same also being done at night. The attendant has thus to work every three hours; and as the time taken by him is not more than an hour-and-a-half, he also has some rest. The charging is divided into three equal periods. In the first, all the retorts of the left vertical tier of each arch are charged; in the second, all those of the middle; and in the third, those of the right tier. The drawing and charging of three vertical-tier retorts take five minutes; for four arches, this means twenty minutes, and for six arches thirty minutes. When carbonizing in 4 h. 48 min., the three men would be working, on the six arches, for 3 × 30 minutes, or an hour-and-a-half. The rest of their time they would be superintending, cleaning up, and resting. The duration of the work of this part of the staff is therefore even less than that of the man looking after the producers. The work is by no means hard, and the heat to which the men are exposed is much less than with horizontal retorts.

The saving in labour which we get would be still more if we had more arches in work. We may say that it would be even still greater, first, with longer retorts, and then with benches made up of a larger number of arches. Further, we do not doubt but that the Lyons Gas Company will obtain better results than we have, with the bench of eight arches of nine inclined retorts, 4·85 m. long, which, after seeing our plant, they are having put up at their new works at La Mouche by MM. P. de Lachomette, Villiers, and Cie. In this case also, the retort-house under construction will contain a second similar bench. We think that it might also be advantageous, from the point of view of saving labour, to have twelve or even fourteen arches per bench, if the size of the works allowed of it. It is also with big benches and with long retorts that the cost of the plant per ton of coal carbonized is the most reduced.

We have only now to give the cost of the motive power expended by all the motors of our plant—that is, for breaking the coal, elevating it, and distributing it in the coal-tanks above the arches, and for the De Brouwer conveyor and the coke-screen. This expenditure in electrical energy, reckoned at 0·102 fr. per kilowatt-hour, is exactly 23 c. per ton of coal carbonized. This price per ton would be greatly reduced with a larger number of arches lighted up. To sum up, during the first quarter of 1902, the manufacture at Vaise of 736,490 cubic metres of gas has cost us for coals, fuel, labour, and power, 8440·90 frs. less than for the same make in 1901; the coal and coke being taken at the same unit price. Our anticipations have, therefore, been altogether realized.

CABLE-GUIDED GASHOLDER AT THE RODEZ GAS-WORKS.

By M. Godinet, of Lyons.

[A Paper read before the Société Technique du Gaz en France.]

We have had to re-construct the Rodez Gas-Works, and when we asked for tenders for the erection of a gasholder, we received from the firm of Bonnet-Spazin (Lyons) a proposal for a cable-guided holder, which we examined and adopted. This gasholder is on the system of M. Sauney, the Engineer of the Bonnet-Spazin works, and I purpose giving the results of tests made upon it before we accepted it. The object of the system is to do away altogether with the columns and bracing generally adopted for guiding gasholders, and to fix the guide-rollers above the water on the tank-coping, where they can be easily examined and repaired. The following principle forms the basis of the system.

If two cables A E F B and C F E D (fig. 1) have their ends A B and C D fixed to a movable plate, and pass over pulleys E F, fastened on an independent fixed frame, this plate will not be able to be moved except parallel to itself, because any inclination could only be accompanied by a corresponding lengthening in one of the cables. In fact, if the plate tilted while turning on its centre O, the fastening points A and B would move about a circumference having the point O for its centre, and would take up positions as *a* and *b* (fig. 2). But merely looking at the latter figure shows clearly that the lines *a* E and *b* F are much longer

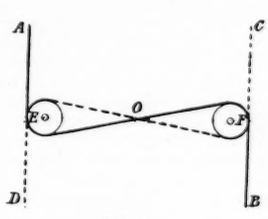


Fig. 1.

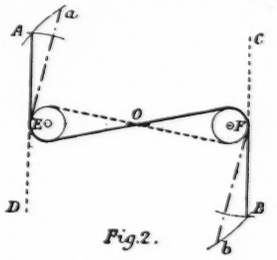


Fig. 2.

than the lines A E and B F. The tilting of the plate, therefore, could not arise without the lengthening of one of the cables. It has just been admitted that the tilting of the plate could only happen by rotating round the centre O. Actually, from the force of a push given at the top or bottom of the plate, the latter might have, also, a side movement which the cables might not sufficiently resist. Hence there is the necessity, in order to limit the movements of the plate strictly to the vertical, to fix against these plates guides against which the pulleys E and F can roll. The vertical working of the system is thus assured by the cables; and side movements are made impossible by the guides.

The application of this system to the guiding of gasholders, both single-lift and telescopic, is as follows: Fig. 3 shows one set of the guides, the number of which varies according to the size of the holder. Each set is made up of two cables A E F B and C F E D, working one against the other, but both symmetrical. Both are fastened at their ends A and C to the top of the lift to be guided, pass over pulleys E and F, which are mounted on the tank-coping or on the dip of the lower lift of a telescopic gasholder, and are tied to the bottom of the lift by their ends B and D. The vertical movement of the lift is thus assured in the same way as was that of the plate in fig. 1. The lateral movements of the lift are prevented by the pulleys, which also form guide rollers running against the vertical ⊔ irons riveted to the sheeting by the side of the cables. The diameter of the rollers is exactly the same as that through the centre of the cable round the pulleys, so that there is no slipping of the cables on

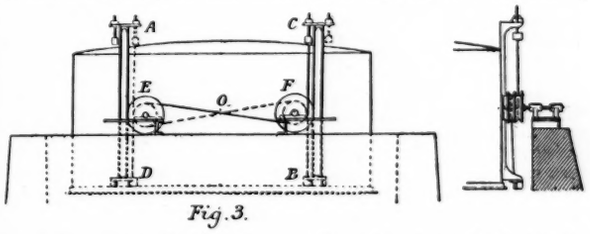


Fig. 3.

the pulleys, nor of the pulleys on the guide-channels during the rising or falling of the holder. This slipping would wear out the cables. The sizes and position of the guide irons and pulleys are determined so that in no case can the latter come in contact with the sheeting. They are always kept at a sufficient distance by the pulley cheeks, which work against the wings of the ⊔ irons. As can be seen from fig. 2, the efficacy of a guide-set is so much the greater the more distance there is between the two pulleys. In practice, this distance is limited as regards gasholders by the necessity of having several sets of guides, so that whatever direction the force of wind may take, two sets at least may be in the plane making but a small angle with this direction—thus exerting their maximum power. Further, the space between the main pulleys necessitates the use of supplementary return ones, to keep the horizontal portion of the cables at a sufficient distance from the sheeting to avoid any contact.

The first adoption of this system was at the Rodez Gas-Works. The principal dimensions of the holder given to the contractors were the following: Capacity, 1500 c.m. (53,000 cubic feet); diameter of the masonry tank, 19 m. (62 ft. 4 in.); depth of tank, 6 m. (19 ft. 8 in.); diameter of the holder, 18 m. (59 ft. 1 in.); height of holder, 5 m. 900 (19 ft. 4 in.); pressure, 65 to 70 mm. (2⅝ to 2¾ in.) of water.

The guiding of this gasholder is made up mainly of eight sets each consisting of two pulley-rollers, 250 mm. (10 in.) diameter, two return pulleys, 200 mm. (8 in.) diameter, two galvanized cables, 17 mm. (11/16 in.) diameter, and about 14 m. (46 ft.) long, able to bear a total breaking weight of 7500 k. (147 cwt.), equivalent to a force of 180 k. per square mm. (256,011 lbs. per

sq. in.); and lastly, of ⊔ guide irons riveted on to the sheeting. The tension of the cables is able to be easily regulated by coupling-screws placed at their top ends.

The calculations for this gasholder were based on a maximum wind force of 120 k. per sq. m. of flat surface, corresponding to a force of 120 × 0·58 = 69·600 k. per sq. m. (14·25 lbs. per square foot) on a curved surface. This figure corresponds to a total force of about 7200 k. (141 cwt.) on the gasholder—that is, half exerted at the top, and half at the bottom of the holder. This force, being transmitted directly by the intermediary of the guide-irons to the pulley-rollers, did not have effect on the cables, and, therefore, the reception tests were able to be reduced to having a force of 3600 k. (71 cwt.) on the top of the holder.

The first operation of the tests consisted in verifying the tension of the cables, and regulating it to 100 k. by means of a special apparatus mentioned later on. This regulating being done, the first trial consisted in exerting a maximum force of 3600 k., applied at the top of the holder (filled with air), in a practically horizontal direction, as indicated. The pulling force was measured by a dynamometer D (fig. 4). The tension having then been reduced to 3200 k. (63 cwt.), the tilting of the gasholder and the tension of the different guiding cables were measured. The inclination of the sides of the holder on the vertical, measured on the total height 5 m.900, was 30 mm. ($1\frac{3}{16}$ in.). The total inclination of the holder on the horizontal, measured by the difference of immersion of two opposite sides, and therefore distant 18m., was about 92 mm. ($3\frac{5}{8}$ in.). A tension varying from 3600 k. (71 cwt.) to 2500 k. (49 cwt.) was kept up for $3\frac{1}{2}$ hours. These variations were caused by the elongation of the pulling cables, and had to be made up for by several times shortening the tackle. The gas outlet-valve having been opened, the gasholder was allowed to fall half way, when it was raised again by pumping in air from the works' exhausters. Although the tension of 2500 k. to 3600 k. was maintained during the rising and falling, these movements were made

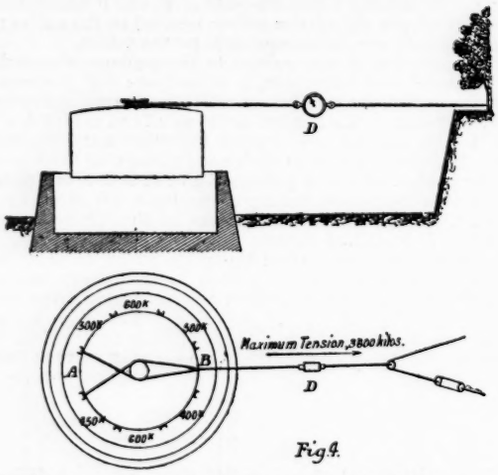


Fig. 4.

with perfect regularity, without any shock, and without any practical loss or gain in pressure. The discrepancies, which were noted by means of an indicator and a water-guage, between the pressures given by them and the theoretical pressures obtained by calculation at the different degrees of immersion of the holder, were kept at about 1 mm. more or less according as the the readings were taken during the rise or fall. The figures given on fig. 4 between two ⊔ iron guides indicate the tension of the cables resisting the upsetting of the holder, while it was subjected to a pulling force of 3200 k. It is obvious that the opposing cables were completely stretched by the inclination of the holder. As regards the two sets of guides placed at A and B in a perpendicular plane to the direction of the pull on the holder, they were evidently uninfluenced in any way by it, and kept the tension that they gave before the test. The bending during these trials of two ⊔ irons, to which was fastened the pulling cable, was such that we were afraid to exceed 3600 k. All the measurements were taken under a tension of 3200 k., corresponding to wind exerting a pressure of 105 k. per square metre (211 lbs. per square yard).

With a view to showing that the working of the gasholder would not be jeopardized in case of the suppression or breaking of one or more sets, we did away with the four guides marked S in fig. 5, each consisting of two opposite cables, and we exerted at the top of the holder a force of 2500 k. (49 cwt.). Under these conditions, only two cables, placed in a plane parallel to the direction from which the force was exerted, resisted the upsetting effort. Their tension was measured, and was the same for both—being 1500 k. (29 cwt.). The two other guides, placed at A and B, obviously did not offer (as in the preceding case) any resistance to the overturning. In spite of this reduction in the guiding cables, the raising and lowering of the holder were done the same way as before. This new trial lasted half-an-hour.

After these tests, we were able to see that the tension of the cables had undergone only an insignificant modification; and so, therefore, their permanent elongation was almost nothing. The conditions under which the tests were carried out would affect the holder and the guiding much more than a wind causing an equa thrust, owing to the duration of the force, and, moreover, as it was applied at one point only, instead of being spread uniformly over the whole surface of the sheeting. The calculation for the guiding was based on a thrust of 120 k. per m² of smooth surface. Under these conditions, if the direction of the wind is exactly parallel to the two guiding sets, and if the resistance which the other sets in oblique planes can offer be taken into account, the maximum tension of the two cables which are alone supposed to

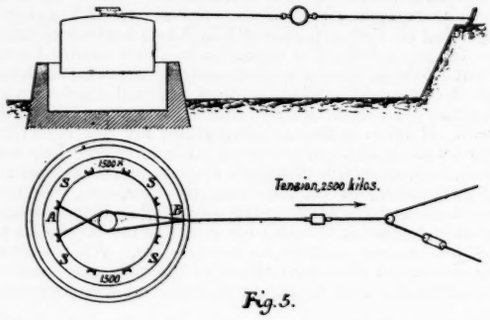


Fig. 5.

resist the wind thrust would be about 1830 k. (36 cwt.), or less than one-quarter of the breaking force of the cable. If, on the other hand, the wind thrust is exerted in between the angle made by two sets of adjacent guides, at least four cables are at work to resist this thrust, and the tension of each of them would be about 980 k. (19 cwt.). The obliqueness of the planes of these last guides sufficiently explains why this tension of 980 k. is more than the half of the previous 1830 k.

It will be remarked that the tensions of the cable measured in the second experiment (a tension of 1500 k. (or 29 cwt.) on two cables for a pull of 2500 k. (49 cwt.) exerted at the top of the holder) do not exactly correspond to the calculated results given above. This is easily explained by taking into account that the pull in the tests was not applied to the top of the holder but really at the top of the crown, or 980 mm. higher. In fact the trials showed that almost all the cables helped to resist the overturning force, although in unequal proportions.

We have now to describe the apparatus used for measuring the tension of the cables, it having been made by the firm of Bonnet-Spazin in view of these trials. Two slightly curved bars A D B (fig. 6) are kept at 40 mm. ($1\frac{9}{16}$ in.) from one another by stays serving as axles for pulleys A and B. Another bar C D L connected at D with the preceding, has on one arm a pulley C, and on the other a scale along which can be moved a counter-weight P. In order to measure the tension of a cable, the two parts of the apparatus are separated by lifting the axle D; the two pulleys A and B are placed against the cable; and the axle D is put back again—taking care also to have the pulley C against the cable. The bar C D L tends to pivot on the point D by keeping the cable so much more from the straight line at the

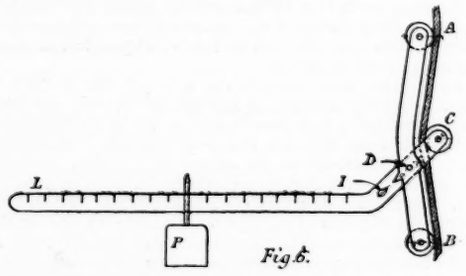


Fig. 6.

point C according as its tension becomes weaker. The weight of the lever L was regulated so that for a tension of 200 k. (39 cwt.) the indices were pointing at one another. In this position—the points C and D being on the same vertical—the bar L is horizontal. The graduation of the bar was arranged so that the tension corresponding to the cable might be read at the point where it was necessary to place the counter-weight in order to have the lever horizontal and the indices brought together. For the purpose of marking this graduation, the apparatus was placed on a cable the tension of which was able to be regulated at will by means of weights, and therefore exactly known. The indications given by this apparatus were not strictly exact; but they seemed near enough for these tests, which proved to be very conclusive.

After these trials with air, the new works were lighted up, and since then the gasholder has worked with gas without the guiding causing anybody the slightest anxiety. It will be necessary, however, as with all new apparatus, to keep an eye on this holder, and to see particularly that the cables, although galvanized, do not oxidize. If they do, they must be replaced in time. This, however, would be very easy; for by raising the holder to its greatest height, the lower fastening of the cables is within reach, and a cable can be changed very easily.

THE "MILBOURNE" AND "PRINS VAN DOESBURGH" SYSTEMS OF PURIFIERS.

In a recent number of "Het Gas," Heer C. T. Salomons states that he finds a great similarity between the Milbourne gas purifier valves described in the "Register of Patents" in the "JOURNAL" for March 18 last (p. 705), and those invented by Heer Prins van Doesburgh, of which that gentleman gave a description at a recent meeting of the Southern Dutch Gas Managers' Association. Heer Salomons also mentions two objections common to both systems of construction—viz.: (1) The improvement in working up the oxide takes place at the expense of good purification of the gas, which should always have first consideration. One or more tiers in the purifying vessels can only be shut out of action with impunity when the purifying vessels have too great a capacity, which is an exceptional occurrence. (2). It is doubtful if the plan of fixing valves inside the purifying vessel is to be commended, as the valve surfaces are constantly in contact with unpurified gas, and can only be reached by opening the chambers. This causes continual expense for maintenance and repairs.

The desired object—namely, to obtain a more uniform fouling of the oxide—would, according to Heer Salomons, be better and more simply attained by employing the grid arrangement of Ed. Jäger, referred to in the proceedings at the recent meeting of Dutch Gas Engineers at Hilversum (see p. 824.). To the Milbourne purifier, described in the "JOURNAL" of April 22 last (p. 1031), the same objections are said to apply; and Heer Salomons quotes with reference thereto a proverb, to the effect that every alteration is not necessarily an improvement. The following particulars of the system of purifiers devised by Heer J. J. Prins van Doesburgh may be of interest to readers of the "JOURNAL," in view of Heer Salomons' remarks on its similarity with the Milbourne system.

The object of the Prins van Doesburgh system is to secure: (1) An enlarged purifying surface on a limited ground area. (2) Complete fouling or exhaustion of the iron oxide in the purifying vessels. (3) That every tier in a vessel shall become in turn No. 1. (4) That it shall never be necessary to empty the vessels on account of their resistance becoming too high. Briefly, this system is said to give an almost perfect fouling of the hydrated ferric oxide, and a saving in cost of construction and in wages. It can, moreover, be applied to existing purifiers. The apparatus is shown in the accompanying drawings. It consists of valves in the inlet and outlet boxes of the vessels, which can be placed differently according as they are used on vessels with two, three, four, six, or more tiers. It thus becomes possible to use the vessel as an ordinary purifier, the gas entering at the bottom of the vessel, passing through all the tiers, and leaving at the top. It may flow either separately through one tier after another, or through all the tiers at once. The plan gives the greatest possible surface for the gas to pass through. This arrangement makes it possible to use each tier of the purifiers as the first through which gas passes; thereby obtaining a better and more perfect fouling of the oxide, but avoiding at the same time any necessity for opening a purifier on account either of too high pressure or resistance.

The invention is said to date from October, 1901; but it had to be kept secret, because of the application for letters patent. It was the upshot of consideration of the question as to how the purifying area at the Gouda Gas-Works might be most readily extended. The problem to be solved was how to obtain sufficient purifying capacity on a very small ground space. The purifying house to be built there by the firm of Louis Smulders and Co. was to contain four adjacent purifying vessels, having water seals, each 19 ft. 6 in. by 16 ft. 3 in. The height inside was 6 feet; and the vessels contained three layers of iron oxide, each 16 inches thick. Between the middle and upper layer there was an opening in the inlet-box, which could be shut or opened by means of a valve. There was a similar arrangement in the outlet-box, between the middle and lowest layer.

It will be seen from the drawing (fig. 1) that the purifier can be worked in five different ways—viz.: (E) It can be worked as an ordinary purifier with tiers, all the valves being closed. (A) It can be worked with the upper tier only. The valve on the inlet then remains open. (B) It can be worked with middle tier only. The valves on the inlet and outlet then remain open. (C) It can be worked with the lower tier only. The valve on the inlet is then closed, and that on the outlet is open. (D) As before, the purifier can be worked with all three tiers at the same time. The valves in the inlet and outlet then remain open. If working has not been commenced according to A or C, and if the inlet and out let valves are opened as stated in B, after the vessel has been prepared, then all three tiers will come into use at the same time. The position B, in which the middle tier only is operative, only becomes possible after the manipulation stated in A has been carried out. In the drawing (fig. 2) of a purifier with six tiers, the same rules will be found applicable as for three.

The vessel can then be divided thus: (1) All tiers operative at once; (2) the three upper and the three lower ones; (3) each tier separately; and (4) all tiers connected in parallel. At the time of the introduction of the so-called compound system, the inventor sent to Mr. Putman Kramer, of the Equitable Gas Company, of New York, drawings for similar high purifiers, which were to be filled by means of a Jacob's ladder and conveying line, and emptied by boxes. The application of his system with valves would, he thought, render the working of such high purifiers more simple and more capable of control. When four purifiers are arranged in a group, it can be shown that all the vessels and all the tiers can be worked alternately as foremost vessel and foremost tier. Of course, the purifiers can be connected up as desired; but a position of the valves is at last reached, in which all tiers come into contact first with the foul gas, and thus are entirely exhausted. It would usually be convenient to treat vessel No. 1 only, as in A, B, and C, and to

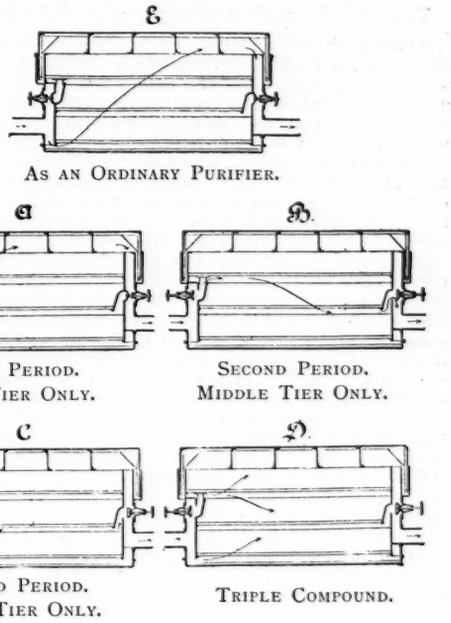
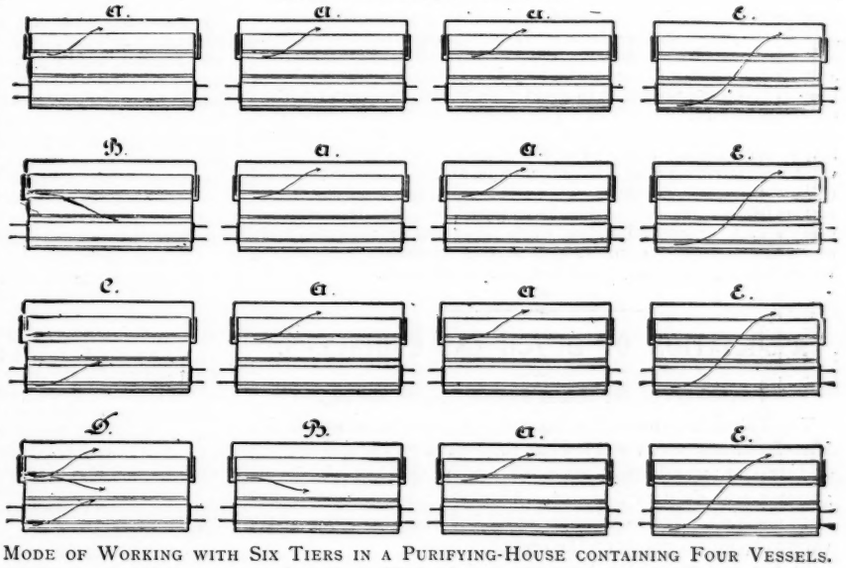


FIG. 1.—PURIFYING VESSEL ON THE PRINS VAN DOESBURGH SYSTEM.

COURSE OF GAS STREAM AND WORKING OF THE OXIDE WITH THE PRINS VAN DOESBURGH SYSTEM.



MODE OF WORKING WITH SIX TIERS IN A PURIFYING-HOUSE CONTAINING FOUR VESSELS.
FIG. 2.

couple up the three following vessels as in E, until a rise in pressure occurs, and A, B, and C are successively introduced. Mistakes with the valves, which might result in unpurified gas passing cannot occur, as the inlet and outlet are always separated by a 16-inch layer of oxide; while a vessel would never require to be emptied, owing to high pressure, before the oxide had been fouled.

PROGRESS IN LARGE GAS-ENGINES.

This was the subject of a paper read by Mr. Herbert A. Humphrey at the meeting of the British Association. In the course of his communication, which was illustrated by a large number of lantern slides, the author traced the development of gas-engines, and pointed out the remarkable manner in which the size and power of this type of prime mover has grown, especially within the last few years—a development which has but few parallels in the history of engineering enterprise. Gas-engines of 1200 and 1500 horse power were, he said, already working; and others of 2000 to 4000 horse power were being constructed. In the Paris Exhibition of 1900, the 600-horse power Cockerill gas-engine created much surprise; but now the makers had in hand an engine of 2500-horse power, and were quite prepared to build one of 5000-horse power. In this country, the first gas-engines above 400-horse power were started in the year 1900, and ran with Mond gas; but at the present time the two leading English manufacturers had delivered, or had under construction, 51 gas-engines of between 200 and 1000 horse power. Two makers —Messrs. Crossley and the Premier Company—collectively supplied 17,600-horse power, of which 12,500-horse power was for driving dynamos. Abroad, apart from all engines of less than 200-horse power, Messrs. Körting Bros. and their licensees had made, or had under construction, 32 gas-engines with a total of 44,500-horse power, averaging 1390-horse power per engine. The Société Anonyme John Cockerill and their licensees came next with 59 engines having an aggregate of 32,950-horse power. So that the average size of engines built by this firm was 558-horse power. The Gasmotoren Fabrik Deutz took the third place with 51 engines developing collectively 20,655-horse power; and they were followed by the Deutsche Kraftgas Gesellschaft and licensees, with engines numbering 29, and giving 16,900-horse power. Although America had lagged somewhat behind the Continent in adopting large gas-engines, there was evidence that this state of affairs would not long remain. The Snow Steam-Pump Works had only recently started the manufacture of gas-engines; yet they had already put to successful work six engines of 1000-horse power each, and were now constructing two enormous gas-engine gas compressors of 4000-horse power each—the first to be running next November, and the second by January, 1903. The Westinghouse Machine and Manufacturing Company had made gas-engines of 1500-horse power, and were prepared to build sizes up to 3000-horse power, either horizontal or vertical. The author described the principal engines mentioned, and dealt with improvements in construction, briefly considering types of engines with a view to show upon what lines development was progressing, and to indicate the kind of machine which might be expected to prove the most successful in the future. In conclusion, he pointed out that the future of gas-engines for central station work depended on their ability to drive alternators in parallel; and he gave numerous instances in which this had been accomplished in regular work.

ASSOCIATION OF DUTCH GAS ENGINEERS.

Proceedings at the Recent Annual General Meeting.

The Thirtieth General Meeting of the Association of Dutch Gas Manufacturers, which was held at Hilversum on the 2nd and 3rd of July last, was largely attended, and a well organized programme was duly carried out. After the private business had been dealt with, the meeting proceeded to the discussion of the various technical points on the *agenda*.

In the first place, Dr. Kramers read a paper answering the question: "In what way does the Kramers' system of water gas manufacture differ from other systems?" He explained the reactions which take place in every water gas plant, and then went on to the essential points of his own apparatus.* In the main, his process was that, in the first place, a gas was formed, consisting of carbonic oxide, hydrogen, and a considerable quantity of carbonic acid, but containing no undecomposed steam, and that, in the second place, the carbonic acid was reduced to carbonic oxide. He next explained the various functions fulfilled by the subordinate parts of his apparatus, when coal was used in place of coke, and gave the names of those parts. As the result of a shallow fire, highly pre-heated air, and a moderate pressure of air blast, his apparatus afforded a duty of nearly 87 per cent. The paper is to be published later with explanatory drawings in "Het Gas," where also full particulars of papers subsequently read on "Suction Producer Gas Plant," on "The 'Duplex Station Meter," and on "Purifiers on the Prins van Doesburgh System" will be given. The substance of the last of these appears on p. 823 of to-day's issue; and the others will be dealt with in the "JOURNAL" shortly.

The new pattern "Duplex" gas-meter with balanced drum,* was expected to give an increase in speed above the 100 revolutions per hour which has hitherto prevailed. This drum was shaped like a flattened sphere, and consisted of two symmetrical parts, each constituting in itself a drum without antechambers. The gas passed into these drums from the chamber lying between the two parts. It was shown, by reference to a diagram, that a 100-light ordinary meter took up 7 mm. (say, 3-10ths) pressure; while a "Duplex" meter of the same capacity, for the same consumption, only absorbed 2 mm. (less than 1-10th). About the same proportion prevailed with the larger station meters. The "Duplex" meter for a capacity of 420,000 to 520,000 cubic feet per twenty-four hours could, without difficulty, run at a speed of 250 to 315 revolutions per hour. It could therefore be assumed that the speed of the station meter was two to three times as great with the "Duplex" construction as with the type now employed. The first station meters of this type would be placed at the Hague and at Baarn.

With reference to the purification of carburetted water gas, it was stated that iron ore, which had been once in a vessel, when used again after being revivified, exercised a harmful effect on the illuminating power of the gas, owing to there being a considerable quantity of tar in the material. This could be overcome by adding a quantity of benzol to the gas at the inlet to the purifying house, when putting in action a vessel filled with material which had been previously used. It was, however, better to fix a condenser before the purifying vessels (as at Enschede), and thus prevent tar being deposited in the materials. Some communications were made on the results obtained with Professor Lewes's method of introducing uncarburetted water gas into retorts in operation. Figures as to the increase of the gas yield could not yet be given. Where blue water gas could not be led into the retorts for technical reasons, it was recommended that it should be introduced at the hydraulic main or at the inlet of the condenser. Widely different figures were given as to the quantity of benzol to be added to uncarburetted water gas to obtain an illuminating power of 14 English candles; but it was agreed that 74 oz. per 1000 cubic feet was about the average. Opinions also differed as to the value of benzol as a carburetting agent. To obtain by carburetting with benzol a gas which would remain permanent, the gas should be perfectly free from naphthalene before carburetting.

On coming to the question of the poisonous qualities of water gas, a poisoning case at Watergraafsmeer was discussed. It appeared from the inquiry held, that the anthracite used there contained arsenic, and that thereby arseniuretted hydrogen was formed, which played its part in the case. With reference to the regulation of incandescent burners, it appeared that, in the hands of consumers, a burner in which the air supply alone could be regulated, was the best up to the present. There were no impurities in gas by which the durability of mantles could be impaired. The breaking of chimneys was generally the result of the glass being of low quality.

With regard to unloading coal from ships by means of conveying troughs, none of the members present could say if this means of unloading had already found practical application.

On the question of purifying vessels, it was mentioned that there were no great objections to making them of stone, or concrete; but that those materials presented no great advantages over vessels of cast iron. For small gas-works, sheet iron might be recommended. Such vessels were in use at Harderwijk, and would be used also at Leerdam. In respect of bending, sheet iron was much stronger than cast iron; but there was a danger of the sides being soon affected by rust. It appeared from a communication on Milbourne's patent purifiers that with this system no connections between the vessels were saved. In an open vessel with cast-iron sides, partitions were fitted. Each section thus formed was closed with a steel cover and india-rubber band. The clamping screws were fastened to the cover, and therefore the filling and emptying of the chambers took place over a plain edge. By one movement, which actuated all the screws at once, the cover was fastened to the vessel. The valves were placed inside the vessels, but were easily got at by means of detachable partitions in the vessels. On the outside of the chamber opposite the valves, cleaning lids were fitted. The gas came into each vessel at the bottom, and passed through four layers. If too great a pressure arose, owing to the lowest layer becoming hard, this tier could be shut out by a valve in the chamber, and the working continued with three layers. An advantage of this system was that almost the entire area of the purifying house did duty as a purifying surface. Experiences of the grid arrangement devised by E. Merz, of Cassel, were unfavourable. The apparatus of E. Jäger, in use at the gas-works at Wiener Neustadt, in Austria, was said to be specially interesting for works where extensions of the purifying capacity had to be effected. The gas passed sideways through the material, so that a larger surface was obtained, and traversed the vessels at a lower speed. This resulted in the material being well exhausted in use.

* See "JOURNAL," *ante*, p. 35.

* See "JOURNAL" for Aug. 12, p. 398.

The question of filling gas-meters with liquids having a low freezing point was fully discussed. It had lost much of its former importance, because gas companies now almost exclusively fitted up dry meters. One speaker mentioned that in a gas-meter filled with a solution of calcium chloride, electric currents would occur, and the metals would be affected thereby. He had measured the differences in tension with solutions of varying strengths, and found them to be considerable. As the percentage of calcium chloride was increased, the difference in tension decreased. When using a solution of calcium chloride, it was advisable therefore to have it as strong as possible. The speaker recommended making experiments with inorganic salts, alcohol, glycerine, various hydrocarbons, &c., as liquids for filling gas-meters. Another speaker was in favour of using a solution of acid-free calcium chloride of about 18° Bé., because it was cheap; and he had found in practice that, if used with the requisite care, the metal of the meter was but slightly affected. It was, however, necessary that the gas should be almost wholly free from ammonia.

With regard to questions concerning three little-known kinds gas coal, it appeared: (*a*) That "Nevill's Brancepeth" gas coal was a Durham coal, which had already given good results at some Dutch gas-works. (*b*) That the "Minister Achenbach" mine at Aken had only just been started, and therefore not much could be said as yet about the quality of the coal. Analysis had, however, shown that the coal did not differ in composition from other Westphalian gas coals. (*c*) That one speaker had obtained excellent results at a gas works in Java with the Youghiogheny gas coal from Pennsylvania, which coal had not yet been introduced into Holland. There was a possibility that it might come on the European market at competitive prices.

The high value of coke as fuel was mentioned. For locomotive boilers, the use of coke presented no disadvantages. A Committee was appointed to report on coke-stoves and on means of promoting the use of coke by private consumers.

In connection with a question as to recent observation of the working of the horizontal "Standard" washer-scrubber, a case was mentioned in which the whole inner working parts of one of these scrubbers had come loose, so that finally only a mixture of wood shavings and pieces of iron remained in it.

This concluded the questions on the *agenda*.

The President, Heer O. S. Knottnerus, of Rotterdam, was heartily thanked for taking the chair at the meeting.

A visit was afterwards made to the Hilversum Gas-Works. The works were built in 1884, and taken over by the town in May, 1885. Several extensions have been made in later years under the direction of Heer H. M. Andriessen, the Manager. They have a productive capacity of about 640,000 cubic feet per diem and storage for 370,000 cubic feet. Last winter the maximum production was 290,000 cubic feet. In 1901, the gas made amounted to about 70,600,000 cubic feet. After the visit to the gas-works, an excursion was made to Soestdijk. Throughout the visit of the Association to Hilversum, Heer Andriessen spared neither time nor trouble in looking after the welfare of the members, and doing everything possible to make the meeting a success.

THE OWNERSHIP OF WATER-METERS.

At the last Meeting of the American Water-Works Association, a paper on this subject was presented by Mr. C. W. Wiles, of Delaware, Ohio. He began by pointing out that the question of whether the meter should be furnished and controlled by the municipality or the consumer had been widely discussed in almost every city in America, and then proceeded to give his own views thereon, as follows.

So frequently do we see reference made to the fact that the grocer and not the customer must furnish the measure and scales to supply his customers with goods, that some think this the final and conclusive argument applying to the supply of water. But do we for a moment believe that the grocer furnishes the measure, scales, counters, show-cases, horse and waggon, &c., free to his customers? Does not everyone know that these are a part of his business outfit, and that the profit on the sales of his goods is placed sufficiently enough that all these things are in the end paid for by the customer? The writer believes that the same rule should apply to the sale of water.

In many cases it is a hardship to compel the water consumer to purchase his meter. He may be a man of limited income and only a temporary resident of the city, and will have no further use for a meter when he moves away. If his meter fails to properly register the water consumed, who is to repair it? He has no knowledge of its construction or means of repair; he cannot take it to his jeweller as he would his clock or watch; he cannot call in his plumber, as he would in case of a broken water-pipe. It must go into the hands of an expert in that particular class of work, and probably will have to be sent to the manufacturer for repair. The expense of repairs will probably be from $1 to $5, besides the carriage charges both ways; and he must rely on the water department to have this done for him. In the meantime, how is the department to know how much water he consumes while the meter is out? They must connect him up direct, and guess at the quantity used, or furnish him a temporary meter.

It is fair to assume that 60 per cent. of the meters requiring repairs will have to be sent to the manufacturer, who alone has the necessary machinery and tools for properly repairing them. The water department must see that this is done, take out the meter, provide the customer with a temporary supply, send the meter to the factory, and, on its return, set it, collect the charges and remit to the manufacturer—in fact, perform all the work as if the meter was owned by the department. As a rule, when a consumer pays from $8 to $14 for a water-meter, he believes he has a machine that will last him a lifetime, or at least as long as his clock; and when, after one, two, or three years, it must go back for repairs, costing him from $3 to $5, he begins to think it a fraud. In a year or two, more repairs are needed; and when, after five or eight years, he is informed that his meter is worn out, and a new one must be bought, he is sure that he has been swindled, and that the water people and meter manufacturers are frauds.

The writer is firm in the belief that all water-meters should be owned and controlled by the water department or the water company, and furnished to the consumer at an annual rental, covering interest on the first cost of the meter and reasonable repairs according to its size and cost, and require the consumer to protect it from frost. Then the water department or the company have complete control; and when a meter fails to work, it is taken out and replaced by another from those in stock. If only in need of small repairs, such as replacing a broken wheel, disc, or bolts, this can be done at the repairing shop; but if in need of more general repairs, the meter can be retained and sent with a dozen or more to the factory by freight, repaired, and returned at a much less expense per meter than a single one. If the water department or the company wish to imitate the grocer and supply as he supplies his customers, then let them fix the rate per 1000 gallons at a price that will cover the expense of the meter, and in time pay for it, as the grocer does with his fixtures.

All water-works managers know that the most difficult and perplexing matter they have to deal with is to fix a flat rate that will be equitable to all; and with the improvements of the present day, it is unreasonable to ask for water at a fixed rate. Under the advancing conditions of water supply, the water-meter is as much a part of the plant as are the pumps, filters, valves, and hydrants, and should be so considered by the municipality or the water company.

REGISTER OF PATENTS.

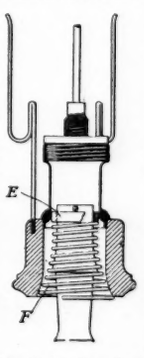
Coin-Counting Apparatus.—Glover, R. T. & J. G., of Clerkenwell. No. 17,786; Sept. 5, 1901.

This apparatus for counting coins and indicating the number counted, consists of a coin trough, a forcing plunger for advancing the coins in the trough, a reciprocating sliding plate for pushing the coins out of the trough one by one, a worm wheel in connection with the sliding plate for operating a counting disc, and a spirally grooved drum of a diameter having a defined ratio to the worm wheel and sliding plate so that each revolution of the drum will actuate the sliding plate a given number of times and discharge a corresponding number of coins from the trough.

When in operation, the trough is filled or partly filled with coins placed on edge as a roll. After the spring controlled plunger has been drawn back, the spirally grooved drum or worm wheel is turned by a handle which, through its toothed wheel gearing into the pinion, revolves the small worm wheel which operates the vertical slide that presses upon the edge of, and forces down, the first coin in the trough as it descends. The coins thus fall out from the bottom of the slide box one by one each time the slide descends, until the last coin falls, when a pin on the plunger enters a hole in the slide plate and locks same so as to prevent any further movement of the apparatus.

Anti-Vibrator for Incandescent Burners.—Sugg, W. T., of Westminster. No. 20,302; Oct. 10, 1901.

The patentee's proposal (as shown in the engraving) is to support the burner-tube on the summit of a sleeve of somewhat enlarged diameter, and carrying the supports for a glass mantle protector if one is employed. The conducting tube for the gas and air is of an external diameter somewhat less than the internal diameters of the burner-tube and sleeve. Around the tube, near the top, is a ring E, fitting somewhat easily; and beneath the ring is a helical spring F, the coils of which are widened, as regards their diameter, in a downward direction, so that they operate as "an elastic support for the bell mouth of the sleeve when the latter is placed over and rests upon the spring in the manner shown." When the burner-tube and sleeve are in position over the conducting tube, the ring E almost fills the bottom of the burner-tube, and the spring forms an elastic support in tension (capable of yielding vertically and laterally) for the burner-tube and its appendages. The conducting tube is screwed to the lantern in the ordinary way, and is therefore subject to the vibrations imparted to the lamp-column. These vibrations are, however, taken up and reduced by the spring before reaching the burner-tube or the mantle supported

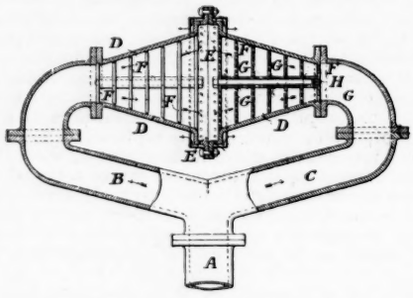


thereby. The mantle is suspended on a peg, which is prevented from imparting an independent oscillating or rotary movement to it by firmly screwing it into its support.

Exhaust Silencers for Gas-Engines.—Wainwright, M., H., & A., of Sheffield. No. 21,577; Oct. 28, 1901.

This invention consists of a chamber connected with the pipe leading from the exhaust-port of an explosion engine, and containing a number of perforated plates through which the gases pass to perforated outlets formed in the chamber.

The pipe A leading from the engine exhaust-port is provided with branches B and C, between the ends of which is a chamber D constructed of any material and size to adequately deal with the exhaust gases in connection with the engine to which it is applied. The chamber is of conical or double conical form; the apices of the cones being provided with flanges to enable them to be attached to corresponding flanges formed on the branch-pipes B and C and with flanges D at their bases, which are secured together by bolts or screws. The bases E of the conical chambers are provided with perforations open to the atmosphere; while in the interior of the chamber are a

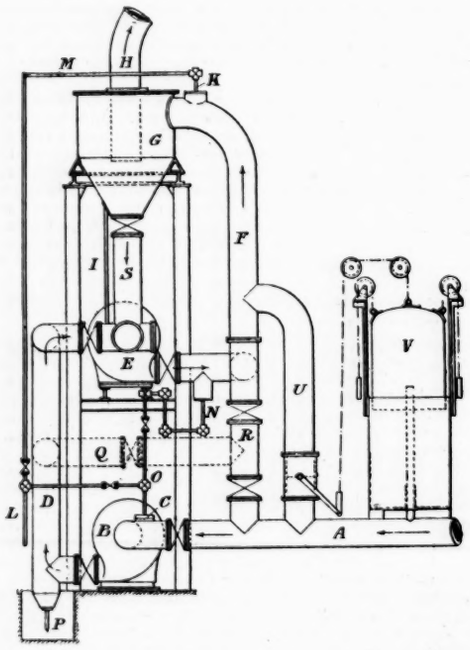


number of perforated plates F, the perforations G in which are—preferably, though not necessarily—wider or larger in diameter at the exit side than at the side at which the exhaust gases enter. These perforated plates are supported on central bolts H; the intermediate plates being kept the required distance apart by distance-pieces or washers. The whole of these central parts are made as small in diameter as possible, so as to interfere as little as may be with the passage of the gases through the plates.

The exhaust gases flow through the pipes A, B, and C; then through the perforations in the plates F; and out through the perforations in the chamber D to the atmosphere. "In doing so, the gases become broken up and the noise of their issuance either entirely overcome or very largely reduced."

Purification of Gases.—Humphrey, H. A., of Northwich. No. 21,720; Oct. 29, 1901.

A method which has frequently been used for purifying gases, the patentee points out, consists in passing them through centrifugal apparatus, at the inlet of which is admitted a water-spray; the water and gas being together thrown, by the centrifugal action, against the



interior surface of the casing of the apparatus, so that they are intimately mixed and the gas more or less efficiently purified. His present purpose is to arrange two or more such centrifugal appliances in series, so that the gas to be purified passes through them successively. There is a bye-pass between the suction and the delivery pipes, so that by adjusting suitable valves the whole or a part of the gas may be caused to circulate more than once through more than one apparatus. For finally removing from the gas the water suspended in it, he prefers to pass the gas through a cyclone, such as is used for separating dust from air. In order to wash the gas systematically, it would only be necessary to pass the water which drains from the last centrifugal apparatus into the inlet of the next preceding one, and so on through the series, so that the cleanest water meets the cleanest gas, and the dirtiest water the dirtiest gas.

The gas to be purified is drawn through the pipe A by the suction of the centrifugal fan B, into the intake of which a water-spray is admitted at C. The gas then passes through the pipe D into the inlet of the fan E, where it meets a second water-spray. From this fan it passes up the pipe F, and enters at a tangent the cyclone G, meeting on its way the water-spray admitted at K. As the gas travels round the cyclone, it deposits on the sides most of its moisture, and finally passes away comparatively dry through the pipe H.

The circulation of the water is as follows: Entering at L, it passes by the pipe M to the spray K, and is carried by the gas into the cyclone, whence it passes by the pipe I into the inlet of the fan E. From this fan, it drains through the water-seal N and pipe O into the fan B at C; finally draining into the sump P. The provision for bye-passing the gas comprises the pipes Q, R, and S, and the various valves.

To prevent the danger of a negative pressure in the main A, and consequent drawing in of air, the bye-pass pipe U between the suction and delivery sides of the apparatus is provided with a valve the lever of which is connected with a floating gas-bell V, the interior of which is in communication with the main A. If the pressure in this main falls, gas is withdrawn from the bell, which consequently sinks and opens the valve to equalize the pressure.

APPLICATIONS FOR LETTERS PATENT.

19,131.—Royle, J. J., "Controlling or transmitting the motion or force of a gas or fluid." Sept. 1.
19,132.—Royle, J. J., and Royles, Ltd., "Reducing and like valves." Sept. 1.
19,135.—Bailly, B., and Chauvin, V., "Acetylene generator." Sept. 1.
19,168.—Postley, A., "Stoppering gas-mains." Sept. 1.
19,220.—Docherty, H. F., and Craig, A. M., "Gas cooking attachments for kitchen ranges." Sept. 2.
19,232.—Gilchrist, J., "Anti vibratory supports for incandescent burners." Sept. 2.
19,246.—Bacher, J., "Acetylene gas generator." Sept. 2.
19,255.—Lake, H. H., "Acetylene gas generators for railway carriages." A communication from the Railroad Gas Lighting Company. Sept. 2.
19,263.—Preston, E. M., "Two-cycle internal combustion engines." Sept. 2.
19,289.—Valière, G. M., "Two-stroke cycle explosion motor." Sept. 2.
19,338.—Prestwich, J. A., "Internal combustion engines." Sept. 3.
19,339.—Wienke, F., and Illy, E., "Gas-saving connection." Sept. 3.
19,380.—Parker, T., "Retorts used in the production of gas from petroleum oils; and a method of treating such oils and the residuals from the production of gas therefrom, and the residues from the production of gas from coal, with a view to facilitate their distillation." Sept. 4.
19,411.—Wicks, J. T., "India-rubber gas-tube." Sept. 4.
19,471.—Bayles, A. G., and Untermann, J., "Radiators for burning gas or oil." Sept. 5.
19,494.—Cox, W., Staples, W., and Glover, G., and Co., Ltd., "Coin-freed apparatus for delivering gas." Sept. 5.
19,525.—Parkinson and W. & B. Cowan, Ltd., and Parkinson, B. R., "Gas and other cooking stoves." Sept. 6.
19,526.—Parkinson and W. & B. Cowan, Ltd, and Parkinson, B. R., "Atmospheric burners for use with gas-stoves." Sept. 6.
19,592.—Thézard, P. V. A., "Acetylene gas generators." Sept. 6.
19,597.—Jeffery, C., and Gibbons, W. P., "Furnaces of gas-retort settings." Sept. 8.
19,664.—Marshall, C., "Anti-vibrator and gas-feeding device for incandescent lighting." Sept. 8.
19,674.—Stevens, L. B., "Gas-pendants." Sept. 9.
19,753.—Haddan, H. J., "Gas-generators." A communication from Fairbanks, Morse, and Co. Sept. 9.
19,836.—Schwab, M., and Greene, H., and Sons, Ltd., "Incandescent gas lighting." Sept. 10.
19,864.—Docherty, H. F., and Craig, A. M., "Burners for gas heating apparatus." Sept. 11.
19,910.—Seaton, A. E., "Double-acting compound gas-engine." Sept. 11.
19,951.—Craw, A. T., "Governors of gas-engines." Sept. 12.
19,975.—Green, W. O., "Coin-freed meters." Sept. 12.
20,004-5.—Terrell, T., "Manufacture of incandescent mantles." Sept. 12.
20,052.—Bray, J. W., "Acetylene gas-burners." Sept. 13.
20,057.—Dempster, R., & Sons, Ltd., and Broadhead, J. W., "Conveyors and elevators for coke or other materials." Sept. 13.

Brisbane Gas Company.—The half-yearly general meeting of the shareholders in the Brisbane Gas Company was held on the 1st ult. From the report submitted by the Directors, it appeared that the statement of accounts for the six months ending June 30 showed a credit to profit and loss (including the balance brought forward from the previous half year) of £10,268. A dividend of 5 per cent. was recommended, amounting to £6995; leaving (after deducting £350 for the dividend-tax) £2923 to be carried forward. Several extensions of mains were made in the period under review; and the Engineer reported that the works were in good order.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Naphthalene—The Sheffield "Cure."

SIR,—May I say a word on the reputed cure of naphthalene—from Sheffield?

I have in my mind two gas-works, each working one class of coal—South Yorkshire Silkstone, screened. At one works, the gas temperature from the inlet to the outlet of the condensers, and even onwards to the governor outlets, was carefully watched and recorded daily, and preserved as far as it was possible in practical working, with atmospheric condensers, at a standard temperature of from 58° to 64° Fahr. at the condenser outlet. The reason this position was maintained as rigidly as possible was due to the fact that if, from any circumstances, the range specified was materially broken away from, and the temperature ran higher—say, up to 80° or 90° Fahr.—naphthalene troubles followed as surely as the "night the day."

At the second works, with coal from the same pits, the conditions of carbonizing plant were very similar in all respects—the type of setting and of heats, the quantity of coal carbonized per day during the winter months the same, as also the type of atmospheric condensers.

At this point, however, differences in working commenced. The theory enunciated by Sir Frederick Mappin had a prior advocate, who, in order to carry his theory into practice, went so far as to apply heat, in the form of coke-fires, to the last tubes in his condenser installation, and maintained at this point an even temperature of from 90° to 100° Fahr. Naphthalene troubles were conspicuous by their absence—for a time. Then gas "blows" began to occur, on the lutes of the purifiers, the seal pots of the scrubbers, and the station meter itself began to show signs of internal disagreements, and had ultimately to be bye-passed in the early hours of a cold February morning.

Investigations then became a necessity; and it was found that the works mains, from the purifiers onwards to the inlet of the station meter, and from the outlet of the station meter to the gasholders, were as nearly as possible solid with "packs" of naphthalene salts, highly saturated with ammonia, which with the high gas temperature had evidently passed the scrubbers. The interior of the case of the station meter was also solid with "salts," with a "churned" passage for the drum; and this, as I have said, had finally to give up its journeyings.

The question I leave your readers to decide is, Why, on two works in all respects similar as to plant and working, up to the one important point, these differences should be found.

We shall possibly hear further news from Sheffield—perhaps not in the immediate future, but presently!

Hull, Sept. 18, 1902. J. HOLLIDAY.

Natural and Other Gas.

Mr. G. Haward Hyde writes thanking us for the "fair spirit" in which the editorial note appended to his letter in the "JOURNAL" last week was written; and he calls attention to a communication (which we had already seen) sent by his firm to the "Financial Times" in reply to their criticism of the circular referring to the shares in the Heathfield natural gas undertakings. In their letter, the firm stated that they have dealt on the London Stock Exchange in the shares of both the Companies alluded to in the circular. To this our contemporary answered that this was the usual method of "making a market," but that such private transactions did not justify the suggestion that there were so many public dealings going on that the business was likely soon to overflow into the provinces. This, however, did not satisfy Messrs. Hyde and Crowder, who, on Friday, returned to the charge with an assurance that their sole desire was to direct the attention of their friends to what they believed was likely to turn out a very successful enterprise. But our contemporary was unable to see its way to alter the opinion previously expressed in regard to the matter. By a strange coincidence, in the issue of the "Financial Times" in which Messrs. Hyde and Crowder's second communication was inserted, there appeared a letter from the Secretary of the two Companies concerned, saying that he was instructed to state, on behalf of both Companies, that they were in no way responsible for the issue of the circular. With reference to this denial, the Editor made the following pertinent remarks: "As the Companies repudiate the circular, the question arises, Why did Messrs. G. H. Hyde and Crowder send it out? Certainly not because they themselves were buyers." Since the foregoing was in type, a letter to the same effect has been received from the Secretary of the Company for insertion in our columns, but is now unnecessary.

Candles for Public Lighting at Llanelly.—With reference to the paragraph on this subject which appeared on p. 772 of last week's "JOURNAL," a local correspondent writes: "Permit me to point out that it is not the gas lighting which is at fault. The cause of the trouble is through failure of the Kitson oil-lamps. The Local Authorities are trying to light part of the town with several of these lamps. The ratepayers, however, want the gas-lamps lighted again."

Lincoln Water Supply.—We understand from the Consulting Engineer, Mr. Percy Griffith, M.Inst.C.E., F.G.S., that the new boring at Boultham (an illustration of the plant used for which appeared in the "JOURNAL" for May 20, p. 1354) has reached a depth of 450 feet, and that 400 feet of 30-inch diameter steel tubes have been successfully lowered. The work is now progressing at the rate of 10 feet per day; and if no serious difficulties are met with, it is anticipated that the boring will be completed to the full depth of 2200 feet well within the contract time allowed—namely, four years.

LEGAL INTELLIGENCE.

The Shooting of Professor Ivison Macadam.

The trial took place in Edinburgh last week of Daniel M'Clinton, who was charged with having, on June 24, shot dead with a rifle Professor Ivison Macadam and a student named James B. Forbes, at the Surgeons' Hall, under circumstances which were reported in the "JOURNAL" at the time (*ante*, p. 23). A strong effort was made by the defence to prove that when he committed the deed the prisoner was insane; but after a trial extending over two days, the Jury brought in a verdict of "culpable homicide." The Lord Justice-General (Lord Kinross), in passing sentence, said that, fortunately for the prisoner, the Jury had taken a merciful view of his case; for it could not be doubted that in this instance culpable homicide almost approached murder. He sentenced the prisoner (who appeared quite composed) to penal servitude for life.

Alleged Theft of Gas.

At the County of London Sessions, Newington, last Friday (before Mr. Loveland-Loveland, K.C.), Herbert Saville, a butcher, surrendered to his bail to answer an indictment for having stolen a quantity of gas, value 15s., the property of the Wandsworth and Putney Gaslight and Coke Company. It appeared from the evidence that on June 18, when the shop now occupied by the defendant was kept by a man named Clifford, the gas was cut off because the rate had not been paid; and on June 23 the meter was taken away. On July 2, the defendant, who had lent Clifford money and had been unable to get it back, took over the premises from him in part-payment of the debt. It was noticed that the defendant was using gas in his shop every evening; and on Aug. 12 an inspector in the Gas Company's service went there and found there was a lead pipe joining the Company's main to the pipe leading to the house, so that the gas reached the fittings and was consumed without having passed through a meter. When defendant's attention was drawn to this, he said he knew nothing about it, and that Clifford was responsible. At the trial, he went into the witness-box, and swore that he did not know that the secret pipe was there, or that there was no meter. In answer to the Jury, it was stated that the place where the meter should have been was inside a cupboard, where it could not be seen. Witnesses were called who gave the defendant a very high character; and the Jury acquitted him.

Wrongfully Taking Water at Bristol.

Last week two youths named Hale appeared before the Magistrates to answer a charge of wrongfully taking from a pipe water belonging to the Bristol Water-Works Company. It appeared that, in consequence of information received as to the taking of their water, the Company instructed their inspectors to keep watch on the premises of Mr. Hale, and also those of Mr. Pillinger, who lived on the other side of the road. From what two inspectors saw when they kept watch on the night of Aug. 15, they kept a closer watch on the following night. They went there about eleven o'clock, and stood outside Mr. Pillinger's house. Later they saw the door of Mr. Hale's house open and a lad come out and walk down the road towards Mr. Pillinger's house carrying a bucket. After he had gone inside, another lad came out of Mr. Hale's house with a bucket, and went to Mr. Pillinger's house; and when inside he closed the door. One of the inspectors, in order to get a view of what was going on, went down a small side lane beside Mr. Pillinger's house. He saw one of the boys come out into the yard with a bucket and put it under a tap supplied by the Company to Mr. Pillinger. When the bucket was full, he took it away, and put another in its place. When the second bucket was full, it was also taken into the house; and the two lads then picked up the buckets, and went out through the front door of Mr. Pillinger's house, and up the road to their father's house. For the defence, it was stated that Mr. Hale had on his premises a supply of hard water from a well, and also a supply of soft water from a cistern. Through the cistern being out of repair, the water got low and dirty, and Mr. Hale, knowing that Mr. Pillinger had a good supply of soft water in his cistern, asked him if he could use it until he got his own cistern cleaned out. Mr. Pillinger gave him permission to do so. Mr. Hale then sent his two sons to get the water from Mr. Pillinger's premises, and gave them instructions not to take it from the tap supplied by the Company. The boys, on the night in question, did not arrive home until late. They then took the water, as usual, from the cistern, which was a few yards from the tap. Six different persons used the tap at the back of Mr. Pillinger's house supplied by the Company; and the inspectors must have mistaken the defendants for some of those persons when they went to Mr. Pillinger's house to fetch water. The Chairman said the Magistrates had not the slightest doubt that the defendants were guilty of the charges preferred against them, and they would each be fined 10s. and costs, or fourteen days' imprisonment. Mr. Pillinger was then summoned for permitting the Hales to take the water, and was fined 5s. and costs, or seven days' imprisonment.

Smethwick Gas Undertaking.—At the last monthly meeting of the Smethwick Town Council, the Gas Committee reported that they had accepted tenders for the supply of gas coal amounting in the aggregate to 26,000 tons, at an average price of 12s. 11d. per ton, or 1s. 6d. per ton lower than last year. They recommended that the Town Clerk be instructed to raise a further loan, not exceeding £10,000 in amount, under the powers and provisions of the Smethwick Corporation Act, 1901. They also reported that they had increased the salary of the Gas Manager (Mr. Vincent Hughes) from £350 to £400 per annum. The report was adopted.

MISCELLANEOUS NEWS.

GAS AND STEAM FOR ELECTRICITY WORKS.

The Comparative Cost.

In the early months of this year, Professor D. S. Capper, M.A., M.Inst.C.E., was asked by the Dumfries Town Council to advise them as to the best method of supplying the burgh with electricity (*a*) for lighting and (*b*) for lighting and tramways combined, and, in particular, as to whether it would be better to use gas or steam as the motive power. In order to decide these points, Professor Capper visited the town twice, and has made estimates and figured out the probable capital and working costs of a considerable number of possible schemes, basing his calculations upon data supplied by the Town Clerk and upon information obtained from the makers as regards Westinghouse engines and Mond gas plant. The report which Professor Capper has presented to the Council as the result of his investigations is of considerable interest; and we therefore reproduce below the portions of it with which our readers will be chiefly concerned. Out of the numerous alternative schemes which he has examined in detail, he has included in the tables which follow his report only those which are the most feasible and show promise of financial success. In all cases the receipts from public lighting are taken at £620—the present cost of lighting the town by gas; while in the case of the tramways, the gross receipts have been calculated at £1750.

Upon the subject of the comparative advantages of the use of gas or steam for generating the electricity, Professor Capper says: Till quite recently it was impossible to obtain gas of a uniform quality, with a comparatively high calorific value, with ordinary coal slack; but by the introduction of the Mond gas-producer, which gasifies the coal at a comparatively low temperature, this end has been obtained in a practical and comparatively satisfactory way, and with an expenditure on labour which may be considered a minimum. In large Mond plants, the methods of working are such that the ammonia liquor lost in the earlier forms of producer is saved; and this being a valuable bye-product, its sale reduces considerably the cost of gasifying the fuel. The Mond process therefore stands out conspicuously as one which is likely, by its reduction in cost of running large gas-engines, to overbalance, under suitable conditions, the universally admitted practical difficulties in applying such engines to rapidly and widely fluctuating loads. On plants of a smaller size than about 1000-horse power, it has been found that it is not remunerative to attempt to recover the ammonia. As with other producer plants—such as the Dowson or its modifications by Duff and others—so with the Mond plant, when below 500-horse power, the difficulty of obtaining a uniform quality of gas with widely varying loads is great, and this counterbalances to a considerable extent the benefits of the high thermal efficiency of the modern gas-engine. With all gas-engines, if a load which exceeds by 10 per cent. the normal working load of the engine is suddenly thrown upon it, the engine is liable to suddenly stop, and thus to throw an extra load upon other engines working in parallel with it, causing them to stop in turn, and thus throwing the whole station into confusion and the town into darkness. It is essential, therefore, that with a gas-engine a larger engine than is required for normal average working should be coupled to each electric generator. This adds considerably to capital expenditure, and at the same time increases the working cost, owing to the fact that the engines are working for the greater part of their time at a low load, and therefore low efficiency, with accompanying irregularity of speed. From these considerations, it follows that the undoubted thermal efficiency of the gas-engine can only effectively be taken advantage of in the case of large plants working on a load not liable to rapid fluctuation. A further practical consideration connected with the gas-engines is this: Gas-engines of moderate size, and still more of large size, have hitherto only been constructed to work at a speed low compared with that of steam-engines. It follows either that belts or gearing must be put between the engine and the electric generator, or that a generator—large, and therefore costly, compared to the power which it gives out—must be used. In the former case, the inevitable losses in gearing of the most efficient kind cause a considerable increase in the annual working costs; or, in the second case, the capital expenditure must be proportionately increased. Hitherto in this country, and, as far as I am aware, on the Continent, or in America, the chief example of a direct-coupled gas-engine is the Westinghouse two or three crank engine; and practically the only firm who have had experience of driving generators direct-coupled to gas-engines in this country are the Westinghouse Company, and even their experience is not extensive. Though the results they have obtained are good, and their engines are of excellent workmanship and ingenious design, I do not consider that in the case of your Royal burgh, and in view of the general objections I have mentioned, it would be advisable for you to adopt Westinghouse engines. With regard to driving by means of belts or gearing, it is only necessary to point to the numerous cases in which such installations have been tried for town lighting and power, and the large proportion of such cases which have proved failures or only very moderate successes, to show that it would be impossible for me to recommend you to adopt this system. I am personally of opinion that the adoption of belt or gear driven dynamos, except in special instances, is a retrograde and inadvisable step in the case of a public supply. There is further, in my opinion, no probability that, within a reasonable time, gas plant of the size required by your burgh for the first few years is likely to be introduced which, for practical working, will equal or in economy so surpass a steam plant as to warrant its experimental use by your burgh. As you will see by reference to the appended tables, the capital cost of installing a gas plant, with the necessary duplication of parts requiring attention and cleaning, will considerably exceed that of steam plant similarly duplicated. With regard to the working and economy of a steam plant, one can speak with absolute certainty, as from years of experience it is no longer in the experimental stage. If properly installed, it can be made to give results which, in a burgh the size of Dumfries, will be profitable both directly and indirectly. The capital expenditure involved in its installation will be less than that for gas; and the annual cost for working, even taking all the probable development in the near future into account, will compare favourably with that of a gas plant. If breakdowns and repairs and the comparative liability to interruption of supply to light and power are taken into account, I have no hesitation whatever in advising the installation of a steam plant of the size required by your burgh in preference to any known or tried system of gas installation. For larger powers than you are likely to require at Dumfries, the full benefits of the Mond producer could be obtained, and the disadvantages of fluctuation in load would be diminished by the fact that the load would be spread over a number of different units. The case then might be materially altered.

After recommending that the power station should be erected at Castledykes, where several acres of land can be obtained, the report continues: In examining into the probable returns which you will obtain from a steam installation for lighting, I have taken as a minimum load the equivalent of 3000 8-candle power lamps. These you might reasonably hope to connect within a short time of the commencement of supply, even allowing for the reluctance to change which is generally to be expected at the outset in a town supplied with gas. If factory premises, hospitals, or other public institutions were connected, this load would be far exceeded at once. From Table II. (*a*) you will see that, with 3000 lamps, together with 368 public lamps connected, you would be able to pay working expenses, and could provide about £420 to £450 a year for sinking fund, &c., by charging 6d. a unit for private lighting and £620 for public lighting as at present. The capital expenditure, if lighting were alone dealt with, would be about £18,250, allowing the ample sum of £2 per lamp for converting your present public lamps from gas to electricity and connecting them to the mains. If 7000 lamps were connected, the corresponding returns with a charge of 5d. per unit would, with the same capital expenditure, provide about £1135 to £1150 for sinking fund, &c.—Table II. (*b*). For 10,000 lamps, *plus* public lighting, which could be just dealt with on the same capital expenditure, the corresponding return of 4d. per unit would allow of between £1200 and £1300 for sinking fund, &c.—Table II. (*c*). The price at present charged in Dumfries for gas is, I understand, from 3s. 6d. to 3s. 8d. per 1000 cubic feet. Taking an ordinary fish-tail burner, this approximately corresponds to just about 6d. per unit. Though Welsbach incandescent lamps would be somewhat cheaper if burning for only the same length of time as the electric lamps, the cost and trouble of cleaning and renewals of mantles, the destruction to decorations, vitiation of atmosphere, and the economy possible with electric lamps (which can without trouble be turned out when not in use, whereas gas is being consumed from the time when the burners are first lit until it is finally put out), makes 6d. a unit for electricity considerably cheaper and more satisfactory even with the most improved burners. It is manifest, therefore, that if by connecting 10,000 lamps electricity could be supplied at 4d. per unit, there would be very little comparison between gas lighting and electricity.

Professor Capper next deals with the style of tramways to be adopted, and then considers the question of an electric lighting and tramway installation combined: The receipts from the tramways are certain to largely exceed the returns that have hitherto been obtained by posting; but so as to be entirely on the safe side, I have estimated the gross returns from the tramways at £1750 in all cases. From the tables appended, it will be found that, with 3000 lamps connected, besides public lighting and allowing for the current required to provide for the half-hourly tramway service which I have suggested, all expenses and interest on capital could be paid, and between £1000 and £1100 could be provided for sinking fund, &c., by charging 5d. per unit for electricity supplied. When 10,000 lamps are connected, the plant will probably have to be increased so as to allow a wider margin of stand-by plant; and for this I have allowed an increase of £1500 on the capital. Even with this increase, all expenses and the interest on capital could be paid, and over £2000 per annum would be available for sinking fund, &c., if private lighting were charged at 4d. per unit, the receipts from public lamps remained as at present, and the tramways showed no increase in revenue. I need hardly point out that the available surplus is more likely to be twice that indicated than to remain at the figure I have mentioned.

Professor Capper points out that, for the purposes of comparison, he has added to his tables probable balance-sheets if gas were used as the motive power instead of steam, from which it would be seen that there was practically no difference between the annual cost with gas plant and with steam, and that with gas plant the capital expenditure would be some £2000 to £3000 higher than with steam; and he concludes his report with the following recommendations.

1.—That the burgh should itself, at the earliest opportunity, apply for the necessary powers and obtain the necessary agreement with the neighbouring local authorities to construct an electric tramway from the Dumfries Station to Glencaple.

2.—That the burgh should itself proceed at once with the erection of a generating station so that it should be ready to supply current to lamps and tramways as soon as possible. The tramways themselves would only take about six to nine months to construct. The plant should be so arranged that it can be extended as the demand requires, and designed at the outset to supply a half-hourly tramway service and 3000 to 10,000 incandescent lamps, besides public lights. The laying of the necessary feeders and distributors for light throughout the compulsory area should at the same time be proceeded with. This would involve a capital expenditure, including the conversion of the public lamps to electricity, of some £19,500.

The tramways from the station to Glencaple, together with the necessary cars, would, when powers had been obtained, involve a further expenditure of some £18,000, or, if condensing plant were added, £19,000.

I.—*Total Capital Cost, including Power-House, Cables, Feeders, Distributors, and all Details.*

1.—With Steam Plant.

(*a*) For Lighting alone :—

Power-house with equipment	£13,500
Distributors and feeders	4,000
Converting public lamps	750
Total	18,250

If condensing plant is installed add £1000 extra to this amount.

(*b*) For Lighting *plus* Tramways from St. Michael's Church to Glencaple:—

Power-house with equipment	£14,750
Distributors and feeders for lighting	4,000
Tramways with equipment	15,000
Converting public lamps for electric lighting	750
Total	£34,500

If condensing plant is installed, add £1000 extra to this amount.

(*c*) For Lighting *plus* Tramways, including Permanent Way, Cables, &c., from Railway Station to Glencaple.

Power-house with equipment	£14,750
Distributors and feeders for lighting	4,000
Converting public lamps	750
Tramways	18,000
Total	£37,500

If condensing plant is installed, add £1000 extra to this amount.

2.—With Gas Plant.

(*a*) For Lighting *plus* Tramway from St. Michael's Church to Glencaple, including Permanent Way, Cables, &c.

Power-house with equipment	£16,400
Distributors and feeders	4,000
Converting public lamps	750
Tramways	15,000
Total	£36,150

(*b*) For Lighting *plus* Tramways from St. Michael's Church to Glencaple, including Permanent Way, Cables, &c.

Power-house with equipment	£16,400
Distributors and feeders	4,000
Converting public lamps	750
Tramways	18,000
Total	£39,150

II.—*Probable Balance-Sheets.*

(*a*) With Steam Plant to supply 3000 Lamps, *plus* Public Lighting.

Expenditure.

Salaries and wages	£400
Oil waste, &c., say	50
Coal, say	100
Interest on capital equal to £18,250, at 3 per cent.	550
Depreciation, sinking fund, &c.	420
	£1520

Revenue.

Public lamps as at present	£620
Private lighting, say, 36,000 units at 6d.	900
	£1520

(*b*) With Steam Plant to supply 7000 Lamps, *plus* Public Lighting.

Expenditure.

Salaries and wages	£450
Oil waste, &c.	60
Coal, say	175
Interest on capital equal to £18,250 at 3 per cent.	550
Depreciation, sinking fund, &c.	1135
	£2370

Revenue.

Public lamps as at present	£620
Private lighting, say, 84,000 units at 5d.	1750
	£2370

(*c*) To Supply 10,000 Lamps, *plus* Public Lighting (Steam Plant).

Expenditure.

Salaries and wages	£500
Oil waste, &c.	65
Coal, say	250
Interest on capital equal to £18,250 at 3 per cent., say	550
Depreciation, sinking fund, &c.	1285
	£2620

Revenue.

Public lamps as at present	£620
Private lighting, say, 120,000 units at 4d.	2000
	£2620

(*d*) With Steam Plant to Supply 3000 Lamps, *plus* Public Lighting and Tramways.

Expenditure.

Salaries and wages	£450
Oil waste, &c.	60
Coal, say	180
Interest on capital equal to £34,500 at 3 per cent., say	1035
Depreciation, sinking fund, &c.	1030
Tramway men, say	365
	£3120

Revenue.

Public lamps as at present	£620
Private lighting, say, 36,000 units at 5d.	750
	£3120

(*e*) With Steam Plant to Supply 10,000 Lamps, *plus* Public Lighting and Tramways.

Expenditure.

Salaries and wages	£550
Oil waste, &c.	70
Coal, say	275
Interest on capital equal to £37,500 at 3 per cent.	1125
Depreciation, sinking fund, &c.	1985
Tramway men, say	365
	£4370

Revenue.

Public lamps as at present	£620
Private lighting, say, 120,000 units at 4d.	2000
Tramway receipts	1750
	£4370

(*f*) With Gas Plant to Supply 3000 Lamps, *plus* Public Lighting and Tramways.

Expenditure.

Salaries and Wages	£450
Oil waste, &c.	60
Coal, say	75
Interest on capital equal to £36,000 at 3 per cent., say	1080
Depreciation, sinking fund, &c.	1090
Tramway men, say	365
	£3120

Revenue.

Public lamps as at present	£620
Private lighting, say, 36,000 units at 5d.	750
Tramways	1750
	£3120

(*g*) Gas Plant to Supply 10,000 Lamps and Public Lighting and Tramways.

Expenditure.

Salaries and Wages	£550
Oil waste, &c.	70
Coal, say	150
Interest on capital equal to £39,000 at 3 per cent., say	1170
Depreciation, sinking fund, &c.	2065
Tramway men, say	365
	£4370

Revenue.

Public lamps as at present	£620
Private Lighting, say, 120,000 units at 4d.	2000
Tramway receipts	1750
	£4370

HALIFAX GAS-WORKS INVESTIGATION.

Alleged Extravagant and Unremunerative Expenditure.

[From the "Halifax Courier."]

We understand that the Sub-Committee appointed to inspect the gas-works, and to report on the advisability or otherwise of proceeding with the ex ensions already commenced, have done so, but state that, owing to the "general chaos," they have not touched the fringe of the work, and consequently only submit a few preliminary items for the immediate consideration of the Gas Committee. The report is signed by Messrs. Arthur Crabtree, J. Armitage Drake, Robert Morley, James Pearson, and G. H. Wadsworth.

The Sub-Committee begin by saying that they cannot find any trace in the minutes of the Council or in the Parliamentary Bills of any sanction being obtained for the expenditure incurred in some of the expensive alterations and additions which have been going on; and they hold that a large amount of capital has been unnecessarily spent on the present small and much crowded site, and believe that a capital expenditure of £70,000 or £80,000 would have been ample for some considerable time. They are surprised no expert evidence was taken, and find the town has been committed to this great expenditure simply on the ideas of persons who have not had previous experience of such work. Too much has been attempted at once; and in consequence contractors' men have had to be engaged to carry out or complete many sections by day work. The various works would have been done much cheaper and more efficiently by contracting for complete erection and connection. They find that the plant is not equal to the work required of it; that sums have been put to revenue that ought to have gone to capital, thus assisting to cover the inflated state of the latter to the detriment of the former, and landing the department into an apparent loss on the trading account. A great mistake has also been made in erecting the tar-works at the present time and site. The Sub-Committee have stopped works to the amount of £9860, and authorized others amounting to £5216.

The Sub-Committee make a number of recommendations, with the view of the Committee having a better grip of the work of the department. Among others, they suggest that no orders be given except by a resolution of the Gas Committee, and under the Chairman's signature; that all tenders be opened in the presence of the Chairman, and be initialled by him; that all specifications and conditions for tendering be submitted to the Committee for approval before tenders are invited; that no structural alterations or additions to plant or buildings be made without a resolution of the Committee, and so on.

The Manager's Observations.

The Manager (the "Halifax Courier" learns) has submitted his observations on the Sub-Committee's report, dealing with it in the order of its clauses. He points out that the borrowing powers for gas-

works are usually granted by Parliament without any restriction, and in this case the Committee of the House never asked for any pledge or details. The successive Gas Committees have had to exercise their wisdom in the carrying out of the extensions, and every part, stage by stage, was made the subject of careful investigation. The acceptance of the tenders is shown upon the minutes of the Council; and in this way, as well as others, authority has been given for all the work that has been done. The carrying out of the building and other work by the staff has been by the full authority of the Gas Committee, who have every fortnight paid the wages and entered them upon the minutes. He refers to the strong feeling for municipal work as against contracting, and says there have been instances in these extensions where local tradesmen have been stopped, in order that it might be done by their own men. He finds it impossible to concur in any statement that the Council, through the appointed means, have not controlled the expenditure on the new works. The orders have been regularly authorized by the Gas Committee and signed by the Chairman.

The Manager then proceeds to detailed remarks on the new works, in order to show that the site has been used to the best advantage, that the money expended is represented by good stone buildings, by strong, sound, useful plant, without unnecessary elaboration, and a minimum only has gone through the pockets of middlemen. Immediately the full benefit of the new works takes effect, the economy of working will be unquestionable. Comparison with the best equipped in the country, in the quality and cost, will convince the Committee there has been no wasteful expenditure. The net capital per million feet of gas sold was in 1902 £645, which compares with £939 in 1876 and £1032 in 1879—the lowest figure being £463 in 1898.

Acting upon the advice of the Town Clerk, the Manager recommended the Gas Committee to consult an eminent Engineer, Sir Benjamin Baker, before the plans which he had drawn were put into force. Why that course was not followed, he cannot say; but the work he had previously carried out for them had probably inspired their confidence. As to the advisability of the Resident Engineer carrying out works, he gives an illustration in the erection of the new scrubbers and ammonia plant, the result of which, when brought into use, will be that the cost of purification, already low, will be lower than any other town for an equal degree of purity. This statement is based on results with purified ammoniacal liquor in the existing scrubbers. No plant has been erected except what was necessary, and no other order of procedure was possible, which the Manager proceeds to show in detail.

The Manager next states that there is not a firm in existence who are makers of all the kinds of plant required. That being so, the imaginary sole contractor would have to buy and sub-contract, with the usual result that the Corporation would have been the losers. He says that no material has been bought for anything beyond what is required to complete the works which are desirable and necessary. He contradicts the statement that the new plant is not equal to the work required of it, and defends the inclined retorts, in which nothing has been discovered pointing to any defect in design or workmanship.

As to capital being charged to revenue, he has asked the Borough Accountant for confirmation, which he is unable to give; and so far as the Manager knows, it is not correct. The Borough Accountant is preparing a statement of capital expenditure since 1898, and the whole of it has been authorized by the Gas Committee. When a large scheme has been passed, the details must of necessity be in the hands of the Engineer, and nothing but what has been involved in this way has been done.

The deficiency on last year's trading is not due to any lack of skill or care on the part of the Manager, because the same management has in previous years been accompanied by large profits. In the two years ending March 31, 1900, the cost of coal was £64,176; in the next two years for coal, oil, &c., it was £96,863—an increase of £32,677. No concern could stand such a drain on its resources without raising the price But the adverse conditions have lasted longer; and, owing to the fall in coke prices, have been more severe than was anticipated.

The Manager goes on to say that the difference between the time before and since his appointment has been £6700 per annum. A large share of this economy is due to the plant erected eight years ago for the production of purified ammoniacal liquor. In those eight years, the Corporation have benefited by that appliance to the extent of £10,000 beyond the cost of it. This was his own invention, and for which he paid patent rights, never receiving a penny in return.

In some concluding remarks, the Manager says that if there lingers in the minds of the Committee any doubt that the money has been wisely spent, he suggests that one out of a list of five eminent engineers he names be asked to investigate the design, carrying out, and cost of the works; and if his share of the work is not vindicated by the gentleman they select from the list, he will not say a word. But, on the other hand, if the award declares him to be entitled to some payment, he hopes the Committee will agree to it beforehand.

THE GAS-WORKS ACCOUNTS.

[*Contributed by Mr. Uriah Bairstow to the* "Halifax Courier."]

It is unfortunate that the meeting of the Institution of Gas Engineers should have been held in Halifax just at this time. The mutual congratulations and compliments which are usual on such occasions have not been wanting; but there has been a restraint about them which has been felt. The public who are having to pay a heavier charge for gas, and who are face to face with an enormous capital expenditure, the remunerative employment of which seems to belong to the distant future, are little disposed to share in them. The modern, up-to-date alterations are causing grave anxiety. Instead of rejoicing at their completeness and adequacy to meet all requirements, we are greatly concerned to know whether the extra charge can be borne without an undue strain on our resources.

The 1902 Abstract of Accounts.

Pending the results of the investigation by the Special Sub-Committee appointed to inquire into the management at the gas-works, we must gather what information we can from the sources which are available. Financial accounts are not always the best sources of information respecting details, because they are largely unintelligible except to those who are technically acquainted with the business. Honestly and fairly kept, however, they give the best general idea as to the efficient management of a business concern. There are certain broad facts of a disquieting character which can be no longer hid: (1) The cost of gas is increasing. (2) Capital expenditure has grown to an extent out of all proportion to the increased requirements. (3) Up to the present the promised economies do not appear.

Comparison with 1896.

This year has not been selected for any controversial purpose, because it favours one side rather than another. It is simply taken because 1896 is the oldest copy of the borough accounts I have in my possession Since then there has entered into the accounts a new element which somewhat interferes with the comparison—viz., the use and manufacture of water gas. The accounts do not distinguish between the amounts of coal gas and water gas, but both are totalled up in one sum. In the analysis of the cost of gas, we have the cost given per 1000 feet sold. This shows that carbonizing and purifying cost 3·32d., and water gas 1·97d.; but we cannot ascertain the relative cost, because we do not know what proportion of each is contained in the 1000 cubic feet sold.

In order to make the necessary comparison, we shall take the quality of coal carbonized, and compare the cost per ton.

	Tons of Coal Carbonized.		Cost.
1896	69,977	..	£11,382
1902	78,211	..	£11,174

These figures give an average cost per ton of 3s. 3d. in 1896 against 2s. 10d. in 1902, equal to a saving of £1600. Further inquiry shows that this is entirely due to the wages account, and has been effected principally during the last twelve months. In 1896, the gas produced per ton of coal was 10,314 cubic feet. Last year (1902), the gas produced was 869,725,200 cubic feet, which at the same rate as in 1896 would have required 84,324 tons. The conversion of this into gas would have cost about £3000 extra.

We have spent more than twice this amount in the production of water gas to make up the deficiency. One would like to know where the advantage of the water gas lies? What do we get for the extra cost? This does not take into account the capital expenditure. We have spent a large sum of money on a water-gas plant, and yet it appears that thousands of pounds might have been saved by sticking to coal gas alone.

The Cost of Gas.

In 1902 gas cost 3¼d. per 1000 cubic feet more than in 1896, due to the higher price of coal alone. The residual products produced pretty much the same results in both years. In the meantime, these have been much more profitable, but have gone back to the same level. The management, of course, cannot be held responsible for the higher price of coal. This, however, seems to be about the only item in the comparison on which the Committee can claim exemption. The account bears out what has already been said about the extra cost of water gas. Compared again with 1896, the figures are—

	1896.		1902.
Carbonizing	3·52d.	..	2·63d.
Purifying	0·60	..	0·69
	4·11d.	..	3·32d.
Water gas	—		1·97
			5·29d.

These figures represent pence per 1000 cubic feet sold. They show a saving in the production of coal gas amounting to ¾d.; but an extra expenditure of 2d. on water gas. This means nearly 1¼d. per 1000 extra cost of production. It is possible to understand capital expenditure which results in economies, but an enormous expenditure which produces results such as these seems to be without excuse.

The Sinking Fund.

Another item, which is somewhat startling, is that of the cost due to the sinking fund. In 1896 it was 1·63d. per 1000 feet. Last year it fell to 0·96d., or less than a penny. When one knows how enormously and unremuneratively the capital expenditure has increased, it comes as a surprise to note that the effort to meet it, instead of increasing, has really been in the other direction.

In 1896, the cost of gas was charged with a contribution to the sinking fund amounting to £4532; in 1902, it had fallen to £3245. Here is a striking illustration of the disastrous effect of the policy embodied in the Act of 1898. At the time the Act was passed, the annual contribution to the sinking fund in the gas-works accounts had grown until it had reached just over 2 per cent. on the total capital expenditure. By this Act, the period of repayment for the balance of the debt was extended to 48 years—thus reducing the annual payment to 0·82 per cent. This very Act which thus reduced the contribution towards the liquidation of the old debt, at the same time made provision for the enormous expenditure which was then contemplated. If it had not been for this relief, it is doubtful whether the Corporation would have dared to undertake the work. If the contributions to the sinking fund had been continued at the same percentage rate on the capital as before the Act, it would have meant an increased charge on the gas-works last year of about £7500, and the loss, instead of being £13,197 (as shown in the accounts), would have been about £20,700.

While the capital has mounted up by 60 per cent., the rate of repayment has gone down 60 per cent., and by this means the burden has been hid away from the ratepayers' sight until it is now too late. It is a policy which hides expenditure, which creates burdens, which means ultimately high rates; and it is a policy we have not yet abandoned. This very year a new Act has been obtained on which the members of the Council have been complaisantly patting themselves and the Town Clerk on the back. This Act gives extended periods for the repayment of loans. It is the same disastrous policy which has already led us

into trouble, and to which the Finance Committee seem so fatuously attached. Even experience such as that we are now having seems unable to shake it off. So far from the rate in 1898 being too heavy, it is doubtful whether the repayments were sufficient even then. Now they are undoubtedly quite inadequate. If the money which has been taken from the gas-works and in times gone by applied to the relief of rates had been more legitimately employed in renewals and improvements in the works to meet the growing requirements of the town, it would have amply sufficed under judicious management. We should have been a quarter-of-a-million better off, and the price of gas need not have gone up, in spite of the increased cost of coal.

We are now feeling the natural result of shuffling our obligations, instead of meeting them. When shall we learn? Are we going to wait until they grow so big that we cannot meet them? Debts cannot be got rid of by ignoring them. We must pay them. A ratepayers' association which only comes into existence to protest against rates going up, and which blindly resists all expenditure without consideration as to whether it is profitable or not, is likely to be of little assistance in the improvement of matters. We must be prepared to face higher rates. They cannot be honestly avoided. The longer the payment is deferred, the higher they will have to go in the long run. A healthy fear of the ratepayers and of their just criticism may exercise a useful check on extravagant expenditure; but a cowardly fear, which hides the truth from them, may lead to disaster. The present position of affairs is serious enough, but worse things await us unless we promptly amend our ways.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) having read the notice convening the meeting and the Auditors' certificate,

The CHAIRMAN proceeded to move the adoption of the report and accounts; remarking that the latter were in a very satisfactory condition. The operations, as they would see, covered the first six months of the current year. He referred to this because on the previous occasion, it would be remembered, they discussed the probability of bringing forward some small alterations in the Articles of Association, and including in them the holding of a general meeting once a year instead of half yearly, and paying an interim dividend. It was due to the shareholders, and equally due to the Directors, that these matters should be considered and approved of by a full Board. They were aware that for some time past the Directors had not had the advantage of the presence of Mr. Stephenson R. Clarke, for he had been away with his regiment in South Africa; but he (the Chairman) had heard that he had just returned. The Directors were nearly sure that Mr. Clarke agreed with them; but they would like to consult him. He was sorry also that Mr. Charles Gandon was not able to be with them, owing to ill-health. Under these circumstances, nothing had been said in the report about the suggested alterations; but the subject might be brought forward next year. Such accounts as had been sent out to the shareholders rendered the duties of the Chairman very simple, and beyond giving any explanations that might be of interest to shareholders, and answering any questions, there was very little to be said. They had that day the advantage of the presence at the meeting of their Manager at Smyrna (Mr. John Gandon); and no doubt the shareholders would prefer to get any information they desired from him. Going into the details of the accounts, he did not know whether he could anticipate any question that was present in the minds of those attending the meeting. In the balance-sheet, sundry creditors figured at £1344, which was something like £2000 less than in the corresponding period of the previous year; and bills payable were also less. The depreciation fund was more; but as this was all invested in Consols and in the debentures of the East London Water Company, the bigger it was no doubt the better they would like it. The Ottoman Government figured for £611. On the other side of the account, capital was very much the same, and sundry debtors nearly the same; while (as would probably have been anticipated) stocks were less by £1290. The result of the balance-sheet was that they carried forward £4470, as against £3341 at the same time last year. Of course, the larger profit made was mainly attributable to the reduction in the price of coal, which had cost them £1372 less than for the first half of last year. With regard to the revenue account, wages and materials had cost £84 more, salaries and office expenses in Smyrna £66 more, exchange £148 more, and depreciation, renewals, and repairs £685 more. Then they came to rent, interest, salaries, and office expenses in London, £922. The amount received for gas-rental was decidedly good; and of this he might state that the general consumers had contributed £519 more than in the corresponding period of 1901; while profit on fittings, meter-rents, &c., showed an increase of £214. For their products, however, the Company had received £127 less than last year. Taking the accounts altogether, the shareholders would be more than satisfied with the result. The Ottoman Government received out of the six months' profits £158; and this made the balance of the net revenue account £3009.

Mr. H. W. ANDREWS seconded the motion.

Mr. A. M. PADDON said he thought the accounts presented demanded some direct compliment. There was always a general compliment paid to the Directors; but some more specific reference should be made to accounts of this description. The gross results were extremely favourable; but the net figures were even more so, because these net amounts were, within certain limits, very much what Directors cared to make them. When considering the amount of profit stated in the accounts, it should be remembered that there was a very

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 805.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	May 14	6⅔	Bombay, Ltd. . . .	6—6⅛	..	5 0 0
40,000	5	,,	6⅔	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Aug. 14	12	Brentford Consolidated	249—254	..	4 14 6
270,000	,,	,,	9	Do. New . . .	184—189	..	4 15 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 12	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2
220,000	Stk.	Sept. 11	10⅔	Brighton & Hove Orig.	207—212*	..	5 1 5
246,320	,,	,,	7⅓	Do. A. Ord. Stk. .	152—157*	..	4 18 9
460,000	20	Apl. 11	10	British.	39—41	..	4 17 7
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c. .	22—24	..	5 0 0
82,850	10	,,	9	Do. 7 p.c. . . .	18—20	..	4 10 0
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10—11	..	6 7 3
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 11	8½	Cagliari, Ltd. . . .	21—23	..	7 3 6
100,000	10	June 12	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2
550,000	Stk.	Apl. 11	12½†	Commercial Old Stock	267—272	..	4 11 11
251,875	,,	,,	9½†	Do. New do. .	205—210	..	4 10 6
271,875	,,	June 12	4½	Do. 4½ p.c. Deb.	130—134	..	3 7 2
800,000	Stk.	May 28	9	Continental Union, Ltd.	138—143	..	6 5 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	147—152	..	4 12 1
575,000	Stk.	Aug. 28	5⅛	Crystal Palace Ord. 5 p.c.	118—123	..	4 6 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5
486,090	10	July 30	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13½—14½	..	5 8 8
15,243,200	Stk.	Aug. 14	4	Gas-light and Coke	4 p.c. Ord. . .	88—90	4 8 11
2,600,000	,,	,,	3½		3½ p.c. max.	88—90	3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	109—111	3 12 1
4,193,975	,,	June 12	3		3 p.c. Con. Deb.	92—94	3 3 10
70,000	10	Nov. 13	8	Hongkong & China, Ltd.		14—15	5 6 8
3,800,000	Stk.	May 14	10	Imperial Continental .		205—207	4 16 7
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.		98—100	3 10 0
561,000	Stk.	Aug. 28	10	Liverpool United A .		225—229	4 7 4
718,100	,,	,,	7	Do. do. B .		165—167	4 3 10
306,083	,,	June 24	4	Do. do. Deb. Stk.		116—118	3 7 10
75,000	5	June 12	5	Malta & Medn., Ltd. .		4¼—4⅜	5 5 3
560,000	100	Apl. 1	5	Met. of Melbourne	5 p.c. Deb.	106—110	4 10 11
250,000	100	,,	4½		4½ p.c. Deb.	103—105	4 5 9
541,920	20	June 12	5½	Monte Video, Ltd. . .		9—10	7 0 0
1,515,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.		103—104	4 6 7
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.		99—100	3 10 0
150,000	5	May 28	8	Oriental, Ltd. . . .		7—7¼	5 6 8
135,000	4⅓	,,	8	Do.		6⅞—6⅞	5 6 8
15,000	1	,,	8	Do.		1⅞—1⅞	4 11 5

* Ex div.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Mar. 13	7	Ottoman, Ltd. . .	6⅛—6⅜	..	5 3 8
851,070	10	Apl. 25	7	River Plate Ord. . .	10—10⅛	..	6 13 4
300,000	Stk.	June 24	4	Do. 4 p.c. Deb..	93—96	..	4 3 4
250,000	10	Mar. 26	8	San Paulo, Ltd.. . .	12—13	..	6 3 1
135,000	Stk.	Sept. 11	10	Sheffield A	236—238*	+2	4 4 0
209,984	,,	,,	10	Do. B	235—237*	+2	4 4 5
523,498	,,	,,	10	Do. C	235—237*	+3	4 4 5
6,000,000	Stk.	Aug. 14	5⅓	South Met., 4 p.c. Ord.	121—124	−1	4 6 0
1,700,000	,,	July 11	3	Do. 3 p.c. Deb. . .	92—94	..	3 3 10
380,940	Stk.	May 14	5	Southampton Ord. . .	102—106	.	4 1⅛ 4
87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton	A. 5 p.c.	118—123	..	4 17 7
300,520	,,	,,	4½		B. 3½ p.c.	93—98	..	4 11 10
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	7—8	..	6 5 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—98	..	5 2 0
230,000	5	Aug. 14	9½	West Ham, 10 p.c. . .	10—11	..	4 6 4
172,000	10	,,	6½	Do. 7 p.c. . .	13½—14½	..	4 9 8
				WATER COMPANIES.			
780,599	Stk.	June 24	11⅓	Chelsea, Ord. . .	300—310	..	3 14 2
150,000	,,	,,	5	Do. 5 p.c. Pref. .	152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—143	..	3 2 11
175,785	,,	Mar. 26	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Mar. 26	8	East London, Ord.. .	215—220	..	3 12 9
654,740	,,	June 12	4½	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
700,000	£0		8	Grand Junction	10 p.c. max..	110—115	..	3 9 7
310,000	Stk.	Mar. 26	4		4 p.c. Deb..	127—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	285—295	..	4 14 11
160,000	,,	,,	7	Do. New, 7 p.c. max..	195—205	..	3 8 4
1,043,800	100	June 24	11	Lambeth, 10 p.c. max..	290—300	..	3 13 4
406,200	100	,,	8½	Do. 7½ p.c. max..	210—220	..	3 17 3
350,000	Stk.	Mar. 26	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 14	12 5/16	New River, New Shares	390—400	..	3 4 0
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	June 12	7	South-wark and Vauxhall	Ord. . . .	195—200	+3	3 10 0
126,500	100	,,	7		7½ p.c. max.	180—185	..	3 15 8
489,200	Stk.	,,	5		5 p.c. Pref..	152—157	..	3 3 8
1,019,585	,,	Apl. 11	4		4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 12	10	West Middlesex. . .		275—285	..	3 10 2
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .		139—144	..	3 2 6
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .		95—97*	..	3 1 10

* Ex div.

† Next dividend will be at this rate.

heavy item debited to revenue—£2074 for depreciation, renewals, and repairs. Every penny of this expenditure was to the direct benefit of the Company; and it required a very great deal of courage—or, as in this case, of good management—to charge such an amount in one half year. Nothing appeared to have been skimped or economized upon which tended to make the profit-earning capacity of the Company greater; and therefore the credit due to the Directors was much more than the amount of profit declared in the balance-sheet would show.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. A. F. PHILLIPS, a dividend for the half year at the rate of 7 per cent. per annum (free of income-tax) on both classes of shares was declared.

Mr. HOUNSOM, in moving a vote of thanks to the Chairman and Directors, said that, considering all things, he thought the accounts were somewhat remarkable. Perhaps he might be allowed to emphasize what Mr. Paddon had said about the item of depreciation, renewals, and repairs. The increase was a very big one; and it was very wise to keep everything in order in that way. It avoided the necessity for having a very heavy depreciation fund; but beyond this, it would enable them, if a pinch came, to rest on their oars for a year or so, and so equalize the dividends—which was a great advantage to the shareholders.

Mr. A. W. OKE seconded the resolution, and it was carried.

The CHAIRMAN, in thanking the proprietors for the vote, again expressed regret at Mr. Charles Gandon's absence. He afterwards proposed that a vote of thanks be accorded to the Manager, the Secretary, and the other officials, both in London and the other side.

Mr. PADDON seconded the motion, which was agreed to.

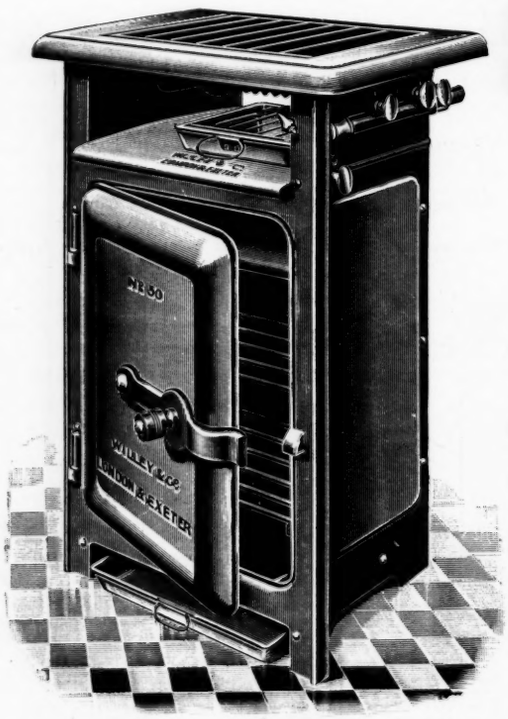
Mr. JOHN GANDON thanked the shareholders for their kindness. He said that the officials in Smyrna had done everything possible for the Company. Of course, they had some heavy times the last few years; but they had got through them very well. As long as the accounts were good, it was not necessary to say anything about them.

The SECRETARY also briefly returned thanks.

COLLAPSE OF A ROOF AT THE CARLISLE GAS-WORKS.

On Monday of last week, a serious accident, by which several men were injured, occurred at the Carlisle Gas-Works. It appears that, early in the afternoon, the roof of the principal retort-house suddenly collapsed and descended upon the retorts, burying everything within the four walls under a mass of iron, slates, and dust. The building in question is the largest upon the premises of the gas-works, and stands in the middle of the site. It is about 118 feet in length and 52 feet in breadth; and the span roof rose from about 30 feet high at the eaves to about 45 feet at the ridge. The retorts occupy the full length of the building; and on the day of the accident, the retorts at the north end were being worked to meet the requirements of the city, while others at the south end were undergoing repairs. Shortly before 3.30, the majority of the men on the shift were engaged in the building placing a fresh charge in the retorts; and having finished, they went outside or congregated near the doorway, as is their usual custom. It was due to this fact that no lives were lost when the collapse occurred; for, without any warning, the roof broke away at the edges and descended bodily with a crash upon the retorts, where it was smashed into fragments. A blinding cloud of coal dust rose into the air; and for a time it was scarcely possible to approach the building to see what had happened. All the men who were standing near the doorway managed to rush outside; but there were others in the building, including three who were doing some repairs above the retorts, and great alarm was naturally felt as to their fate. A stoker named Alexander Turnbull was wheeling an empty truck at the time of the collapse; and although the retort-bench prevented the roof falling in a mass to the floor, slates were sent spinning down, and one of these struck him on the head. He was able to make his way out; but blood was flowing freely from a large, deep wound. Under the direction of Mr. Wills, the Manager's assistant, efforts were directed towards extricating the three men on the bench from among the *débris*; and the employees undertook the risky work with commendable pluck. Two of the buried men were not much injured; but the other man, named Robert Gilliland, was unfortunately crushed beneath a large mass of material, and was extricated with difficulty. One of his legs was broken; and he was suffering from the crush upon his chest. The roof consisted of a wrought-iron frame and slates; and there had been no reason to suspect that it was insecure. The cause of the collapse cannot therefore be definitely stated; but it is surmised that the iron had become weakened by the extremes of temperature. The walls of the building remain quite firm. The Manager (Mr. W. J. Smith), who was absent from the works when the roof gave way, arrived shortly afterwards, and immediately took steps to ensure the supply of gas being uninterrupted. As it happened, the retorts in the smaller building adjoining were all being worked, and less than half of those in the larger building were in operation; so that the danger of failure in this respect was not so serious as it might have been. Mr. Smith, however, set a number of men to work to clear as much of the bench as was necessary to attend to the retorts in use; and the City Surveyor (Mr. Marks), who had visited the works, sent a number of his men to assist in removing the wreckage. By this means, the continuous supply of gas was assured. According to latest advices, Gilliland is keeping as well as could be expected under the circumstances. He had a thigh and three ribs broken. It is stated that the roof which fell was of poor design, and had been in use for thirty or forty years.

The Directors of the Cape Town and District Gaslight and Coke Company have declared an interim dividend on the ordinary shares at the rate of 10 per cent. per annum for the half year ended June 30.



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ASSESSMENT APPEAL BY THE GRAND JUNCTION WATER COMPANY.

At the last Monthly Meeting of the Assessment Committee of the Kingston Union, the Grand Junction Water Company appealed against the assessment of their property in the parish of Hampton, which had been put at £28,511 gross and £23,124 net, for water-works, mains, and pipes.

Mr. MARSHALL, who appeared for the Company, said their assessment had been increased in the parish of Hampton from a rateable value of £12,420 to £23,124. This was practically the valuation which he himself gave before the Arbitrator (Mr. Ernest Page, K.C.); but inasmuch as the Arbitrator did not adopt his valuation of the mains, but increased it enormously, the Directors would not agree to the present figures. His valuation of the mains was 9·35 per cent. of the water-rental, which he gave in evidence before the Arbitrator. After twelve days' hearing, however, that gentleman fixed the rateable value of the mains at 23·84 per cent. of the water-rental, or about 250 per cent. in excess of his (Mr. Marshall's) valuation. In order to arrive at this figure, the Arbitrator must have materially reduced the valuation of the works, because they got the value of the whole undertaking in the first instance, and then deducted the value of the works, and the residue represented the value of the mains. He did not wish to go into details, but he was authorized by the Directors to offer to settle the matter, as they might not be in existence very much longer, but would probably be handed over to the Water Trust, and they were willing to settle this appeal at £23,500 gross and £18,000 rateable, which was about 50 per cent. in excess of the old rating. He could not go beyond this offer, which was the Directors' ultimatum. Having said this, he would retire and allow the Committee to go into the matter.

Mr. COOKE said, for the works alone—the bricks and mortar part at Hampton—irrespective of the life of the mains, which earned the money, Mr. Marshall's own valuation was £20,531. The Company agreed to his (Mr. Cooke's) valuation of the mains in Teddington and Hampton Wick; and if the Committee dealt with the mains at Hampton on the same basis, they would arrive at a higher total rateable value than that to which the Company were now objecting. He said there ought not to be a single penny reduction from the figures of his valuation. Indeed, upon reflection, he thought the Company themselves would think that the Committee had done them good service in making their property of such value, because in some form or other they would be paid upon it If this appeal went to Quarter Sessions, Mr. Marshall would find himself in the awkward predicament of having to disprove his own valuation. He urged the Committee, without hesitation, to adhere to their valuation.

The Committee unanimously confirmed the assessment; and Mr. Marshall was called in and informed of their decision.

Mr. MARSHALL suggested that, rather than go to Quarter Sessions, the matter should be referred to Mr. Page, who was thoroughly acquainted with the whole question.

The CLERK (Mr. J. Edgell) said they must go to Quarter Sessions in any case, in order to get the matter referred to the Arbitrator.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Probably the last reference I will require to make to our late friend Professor W. Ivison Macadam is one relating to the trial of the man D. M'Clinton, who caused his death. This person was put on trial before the High Court of Justiciary—the highest criminal tribunal in Scotland—on Wednesday and Thursday. A most disappointing verdict was returned. Had it been found that the man was insane to the extent of not knowing what he was doing, the decision of the Court would, of course, have been that he be kept in confinement so long as he was bereft of reason. But if that conclusion could not be reached, then he was guilty of murder, and should be now under sentence of death. The Jury, strange to say, found him guilty of culpable homicide, which means that they disregarded the plea of insanity, and believed that the shots were fired by a man who knew what he was doing, and was responsible for his actions. Why the verdict was not one of guilty of murder can only be explained by the weight of the defence and the reluctance of juries in Scotland to bring in a verdict which would lead to an execution. There is much dissatisfaction at the result. The sentence was one of penal servitude for the whole term of natural life, which means that the accused will never be released, but must end his days in prison. The punishment is probably more severe than would have been death on the scaffold; but the general feeling is that the law, as it at present exists, has not been applied, but has been strained in a way to produce future complications.

I do not know to what influence it is possible to attribute the appearance, in the "Dundee Advertiser," on two days this week, of articles condemning the quality of the gas which is at present being supplied in Dundee. At this moment, when the Town Council are engaged, manifestly at their leisure, in selecting a gentleman to manage the Corporation gas undertaking, and seeing that he who has charge of the works at present is one of the applicants for the post, it scarcely requires reflection to show how ill-advised is the publication of anything which might affect the votes of the councillors when they come to make the appointment. But, not to go so deep into the subject as this, it is, on the face of it, the height of folly to begin agitating just now about the quality of the gas, because there is going to be a new arrangement. If the gas should be bad just now, it might not be so when the new Manager gets to work; but, if it should continue to be bad, then would

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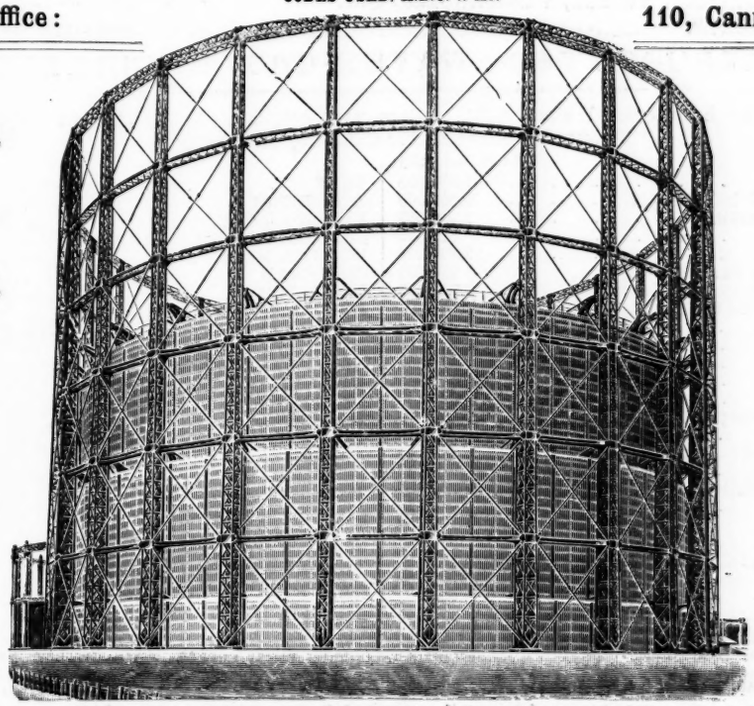

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GASHOLDERS.

be the time to speak out, not now. Returning to the articles which were published, the first noteworthy element in them is their hollowness. There is internal evidence that the alleged complaints about the quality of the gas are unreal. There has been no recent drop in the illuminating power of the gas. On the contrary, the articles themselves show that it has slightly improved of late. Under a Provisional Order which came into force at the end of July, 1901, the Corporation are entitled to supply gas of not less than 15-candle power. Previously the minimum had been 18 candles; and the gas supplied was about 22 candles. Since the new Order was obtained, the illuminating power has been mostly about 18½ candles. It is now 19 candles. Gas consumers have had a whole year in which to make complaints about the reduced illuminating power of the gas. No complaint was made till now; and the thing which has now taken place is that, all of a sudden, the reporter for this newspaper has discovered that "the illuminating power of Dundee gas, which for a considerable time has been a source of much dissatisfaction to consumers, has evidently of late for some reason or other been exceptionally low, and much exasperation has been caused by the experience, which has been only too general since the advent of the longer nights." It is made to appear that the first notes of complaint were found in the dimness of the churches during evening service in the past two or three Sundays. Several churches are mentioned, in which the light is said to have been exceptionally bad. The reporter apparently went round soliciting information. We know what sort of information would be got in the circumstances, or in any other department under similar conditions. It is wonderful the quantity of ill-digested, inchoate opinion which may be made to set in a particular direction, if anyone seeks to do it. These articles were full of such examples—in fact, they may be fitly described as an endeavour by a person who did not understand the subject to put together ideas of people who were more ignorant than himself.

Who is Gas Manager at Dundee? I understood that the post was vacant; but according to the "Dundee Advertiser" of Wednesday, the "Gas Manager" reported on the previous night to the Works Committee as to the make of gas. It was agreed upon a fortnight ago that the Town Council were to meet in Committee and make the appointment. Have they done so, and no one outside been aware of it? That can scarcely be, because I understand that yesterday there was at least one gentleman who is on the short leet in Dundee in connection with his candidature. If the appointment should be, in reality, made already, the Corporation would surely have the courtesy to let other candidates know that such was the case. Or is there to be no appointment, but matters to be left to go on as they are? Such a length of time has been taken over this business that when one begins to think of it, one can scarcely say where one is. Surely the appointment will not be long now in being made.

As to the report which was presented to the Works Committee, it is stated that the make of gas per ton of coal during the first week of September was 10,512 feet, and during the second week 10,694 feet; and that the cost of carbonizing was 2s. 2d. per ton of coal, as against 3s. 4¾d. last year. It is added that 6665 tons more of coke have been sold in the current year than in the same period of last year. With such results, where is the necessity for appointing a Manager with a large salary? He could do little, if any, better than this.

At the last meeting of the Arbroath Town Council, Bailie Melvin, the Convener of the Finance Committee, submitted the burgh accounts for the past year. With regard to the gas account, he said it showed a deficiency of £1819. In explanation of this very large deficiency, they found that the sum entered for coal in the year's estimates was £7500; and when they looked at the accounts, they found that the actual cost of coal, including coal breakers' and trimmers' wages, amounted to the sum of £8351, or £851 more than what was estimated for. This included 300 or 400 tons entered in last year's stock sheets, but which did not actually exist. The residual products were estimated to produce £1330; while as a matter of fact they only brought £925—a deficiency of £424. The estimated amount from coke was put down at £530; while the actual sum received was £151, or a loss of £378. A number of smaller items, such as water, and certain legal expenses, amounting in all to about £180, were not provided for in the estimates. These, together with the various deficiencies mentioned, make up the total sum of £1819, which was the debit balance on the account. The Gas Committee, at the same meeting, submitted estimates for the current year, which showed an anticipated expenditure of £12,932, or, with the deficit on the past year, of £14,751. They proposed that the price of gas be retained at 4s. 4½d. per 1000 cubic feet, at which figure it is expected that the deficit will be wiped out in the course of the year, and a surplus of £9 18s. be left. This proposition was agreed to. The Gas Committee also reported that the Manager (Mr. A. C. Young) had reported to them that the new retort-bench was practically finished, and that the quantity of coal carbonized per eight-hour shift was found to be 56 cwt., against 40 cwt. with the old plant; and that although some increase of wages had been given, he expected a saving of about £200 per annum for carbonizing wages. The men were thoroughly satisfied with the new system, and he considered credit was due to them for the way in which they had taken to it. The Committee expressed their satisfaction with the result, and with the improvement made in the works, as well as with the manner in which the various contractors had carried out their contracts. They agreed to hold a meeting at the works in order to inspect what had been done.

There is no place in Scotland which can be compared with Falkirk in the matter of gas supply. The gas undertaking has been in the hands of the Corporation since 1894. At that time the works, producing 52 million cubic feet a year, were supposed to be working well up to their full capacity. They have not been enlarged, though additional plant has been stowed into them, and a large new gasholder has been built; but so great has been the demand for gas, that the output last year was 130 million cubic feet. The consumption of gas has more than doubled in eight years. That the Manager (Mr. J. Kincaid) finds the means of producing the quantity now required is a cause of

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COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000

	Cubic Feet Daily.
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. BROCKVILLE (ONT.), 250,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft.

wonder to everyone. This work must be a constant anxiety to him. I have referred to the placing of additional plant in the gas-works. It is almost a pity that such has been done, because the works are, after all, old and inefficient; but the capital account has been increased from £50,000 to £119,000, and a further very large outlay is about to be incurred, in the erection of new works—a subject which had been under consideration for several years, and which it would have been to the advantage of the community had it been further advanced. It is probably the greatest cause for gratification, however, that, while the demand for gas has been outstripping the means of producing it, the price has been all the time going down. At the time of the transfer, the price was 4s. 2d. per 1000 cubic feet. Two years ago, it had been reduced to 3s. 9d. This was a time of dear coal, but the Corporation were able to carry on without raising the price of gas. Not only so, but they made a profit; and last year they were able to reduce the price to 3s. 4d. Now comes the welcome intelligence that a further reduction is possible. This was effected on Monday, when the Town Council resolved to make the price 3s. per 1000 cubic feet to ordinary consumers, and 3s. 4d. to consumers who use prepayment meters. The selling of gas at 1s. 2d. per 1000 cubic feet below the price charged by the Company, is held to be conclusive evidence that the transfer was a wise step in the interest of the community. The Corporation are, it may be said, in somewhat of a difficulty because of their prosperity. In reducing the price of gas, they are likely to encourage an increase in the demand, which their works make it almost impossible they can meet. If, in order to somewhat check the growth in the demand for gas, they continue to charge a high price, they make too much profit. This is how they are situated at present. Last year the revenue of the undertaking was £23,077, and the expenditure £16,469. There was thus a gross profit of £6608. The amount required to meet interest, sinking fund, bad debts, and the like, was £5657; and the surplus on the year's working was £951. There was, however, previously accumulated profit to the amount of £1932, which, added to the past year's surplus, gave £2883 in hand. The Town Council on Monday directed that, out of this sum, £1000 should be placed to the reserve fund, and the balance of £1883 carried forward. But there is a sequel to this fair voyage of the gas undertaking. The Assessor for the district sought an interview with the Gas Committee; and as the result of this meeting, it was reported on Monday night, the valuation of the gas-works has been advanced £1073. This, it was explained, means an increase of about £300 in the amount of the rates and taxes for the year. In reducing the price of gas, the Council seem to have come to the view that they had better not make too much profit, seeing that they have to pay a large proportion of it away in taxation.

The estimates for the current year of the Greenock Corporation Gas Department were submitted to the Town Council on Tuesday, by Mr. Morison, the new Convener of the Works Committee. The estimated income is £54,017, and the expenditure £49,161; leaving an anticipated surplus of £4856. The price of gas was reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet.

The report submitted to the recent annual meeting of the St. Andrew's Gas Company stated that the income from all sources during the past twelve months was £8115; being an increase of £361 over the previous year. The profit was £1461; and the gas manufactured amounted to 43,639,000 cubic feet—an increase of 9 per cent. The quantity of coal carbonized had been 4300 tons. The number of consumers was 1877, or 35 more than last year; and of these, 196 were supplied through slot meters. Some 117 gas-cookers were in use; being 45 more than in the previous year. The usual dividend was declared; and the Directors recommended the reduction of the price of gas to 3s. 6d. per 1000 cubic feet, or 1d. less than last year. The Chairman, in moving the adoption of the report, stated that the continued prosperity of the Company was largely due to the Managers—Messrs. Hall. It would be necessary in the near future to face an expenditure of about £3000 for an additional gasholder. This would, in all probability, reduce the dividend; but it was impossible at present to speak with any authority on the subject. The business of the Company was rapidly increasing. The price of gas was to be reduced to 3s. 6d.; and this, taking into consideration that there was a reduction of 2d. last year, was very considerable. The report was adopted.

In January last, the Edinburgh and District Water Trust, on the proposal of ex-Bailie Archibald and Sir Andrew M'Donald, instructed their Treasurer, Mr. William Anderson, and their Engineer to prepare a return showing the parliamentary estimate for the works under the Talla scheme, the sums of money borrowed, and the probable amount yet required to complete the works, &c. This return has now been printed. It shows that in January, 1895, the then Engineer estimated the capital expenditure at £695,000, which includes a sum of £30,000 for filters, reservoir, and clear-water tank at Fairmilehead, the construction of which has been postponed owing to a revised estimate showing a necessity for the expenditure of nearly £200,000 on this work. Against this total, there is set the expenditure which has been incurred up to May 15, 1902, amounting to £617,000, which, with a probable expenditure of £499,788 yet to be provided for, brings the total cost of the Talla scheme up to the sum of £1,116,788. In this estimate, however, no allowance is made for contractors' claims for extras, which at this date reach a total of £60,000; nor for any expenditure upon the Fairmilehead service reservoir and filters. These sums added bring the probable total cost of the scheme up to £1,376,788; thus showing an excess of £661,788 over the parliamentary estimate.

Price of Water at Cleckheaton.—The General Purposes Committee of the Cleckheaton District Council have decided to reduce the scale of water charges to the extent of 10 per cent. as from Jan. 1 next. The whole of the capital debt on the water-works account has now been repaid, and the Council have a considerable balance in hand for any emergency that may arise. The reduction announced will represent about £400 a year.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 20.

Sulphate of Ammonia.

In the early part of the week, there was keen competition for parcels offered, and in some cases extreme prices were paid. Since then the demand has slackened somewhat, urgent orders being covered, and consumers abroad being unwilling to pay current prices. The closing quotations are £12 2s. 6d. per ton f.o.b. Hull, and £12 5s. to £12 6s. 3d. per ton f.o.b. Leith and Liverpool. For October delivery, makers have accepted a discount of 3s. 9d. per ton. In the forward position, buyers have not followed the further advance demanded by makers, and no important first-hand business has transpired. On the other hand, speculators are not venturing to offer abroad substantially below makers' prices.

Nitrate of Soda.

This is steady on spot at 8s. 4½d. and 8s. 7½d. per cwt. for ordinary and refined qualities, respectively. For spring delivery, dealers are offering at 8s. 7½d. for ordinary quality.

LONDON, *Sept.* 20.

Tar Products.

There is a slight improvement in the outlook generally; there being more inquiries, especially for forward delivery. Pitch continues very firm for home consumption, for which very high prices are being paid. There are also buyers over all next year, but business does not at present result; it being generally considered to be too far forward to entertain contracts to any extent, especially before the tar is secured. In crude carbolic, business has been done at 1s. 8d. and even 1s. 8¾d. for prompt delivery. There is a good inquiry for October-December; and it is quite probable that this article may increase in value, although at present crystals do not show any signs of improvement. Creosote is decidedly firm, owing to several large orders having been sent into the market for export, which will relieve stocks in both London and the country. As regards benzol, a little business is reported in 90 per cent. at 8d. for early shipment, while for 50-90 per cent. 7¾d. has been paid for prompt and declined for October-December. The position of anthracene is unchanged; but there is a little better inquiry for next year, although prices do not show any signs of improvement.

The average values during the week were: Tar, 18s. 6d. to 23s. 6d. Pitch, London, 52s. to 53s. 6d.; east coast, 49s. to 50s.; west coast, 45s. 6d. to 47s. Benzol, 90 per cent., 8d.; 50-90 per cent., 7¾d. Toluol, 7d. Crude naphtha, 2¼d. to 2¾d.; solvent naphtha, 7¾d. to 8d.; heavy naphtha, 9d. Creosote, London, 1⅝d. to 1¾d.; North, 1 1/16d. to 1 1/8d. Heavy oils, 1⅛d. Carbolic acid, 60 per cent., 1s. 8d. Naphthalene, 30s. to 40s.; salts, 20s. to 21s. Anthracene, "A," 1½d. to 1¾d.; "B," 1d.

Sulphate of Ammonia.

The market is decidedly quiet for forward delivery; but for prompt, there is still a very good demand. The Gaslight and Coke Company still quote £12 5s. for prompt, and £11 15s. forward, but would probably accept a little less for November-April. In Hull, business is reported at £12 2s. 6d. for prompt, and £12 early October. In Liverpool, business is reported at £12 6s. 3d. for early shipment, but £12 2s. 6d. has been accepted for the first fourteen days of October. As regards Leith, it is difficult to fix the price. There are buyers at £12 2s. 6d. to £12 3s. 9d., but sellers ask £12 5s., at which business does not appear to result. The general tone of the market is quiet; but there are not wanting signs that the demand for October will be well maintained.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Taking it all through, the position in the coal trade shows a tendency, if anything, towards lessening firmness. Requirements for house-fire consumption have not yet developed into any briskness. Although here and there merchants and consumers are putting down extra quantities for the ensuing winter's needs, business for the most part remains slow, and not sufficient to take off all the output of the collieries working about four to five days per week. The unsatisfactory condition of many of the large coal-using industries is also having its effect upon the demand for the lower qualities of round coal and engine fuel, supplies of which are becoming more plentiful on the market; and special clearance lots are again being offered in considerable number at under current quotations. No actual giving way is noticeable in the quoted pit prices; and with regard to house-fire coals, there is talk in Yorkshire of some advance with the close of the month. But so far nothing definite is decided in the Lancashire district, where any upward move is for the present in abeyance pending the conditions that may arise in the meantime. In house-fire qualities, best Wigan Arley remain steady at 13s. 6d. to 14s. per ton at the pit, Pemberton four feet and seconds Arley 12s. to 12s. 6d., and common house coal, 9s. 6d. to 10s. With regard to steam and forge coals, although collieries are not giving way in their quotations either for specified quantities or for contracts, there would in some quarters seem to be a good deal of concern as to how long prices are to be maintained unless some improvement takes place in the engineering, iron, and cotton trades, and other important coal-using industries. At the pit, average inland quotations for good, ordinary qualities of steam and forge coals remain at about 8s. 6d. to 9s. per ton, and it is only on special lots for prompt clearance that anything less is being taken. Of engine fuel, supplies are ample to meet all requirements, especially in the medium and lower qualities. Some of the Lancashire collieries have no difficulty in moving away all they are

THE
MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.
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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
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THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
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producing; but a good deal of slack is now coming in from outside districts, and consumers are able to place orders on easier terms than would have been accepted a few weeks back. Quoted rates, however, are nominally unchanged at about 4s. 9d. to 5s. per ton at the pit for common, 6s. for medium, and 6s. 6d. to 7s. for best qualities of Lancashire slack. The shipping trade remains indifferent, and low prices are being taken to secure cargoes for prompt clearance of surplus output, 9s. 6d. being a very general figure, with 9s. 9d. to 10s. average quotations for better qualities of steam coal delivered at the Mersey ports.

Northern Coal Trade.

There is a steady demand in the coal trade, and on the whole prices are maintained. For some of the second-class coals, however, the tendency is scarcely so strong; the waning of the Baltic demand showing signs of approach. For best Northumbrian steam coals, the price is 11s. 6d. per ton f.o.b., and generally speaking the collieries are well employed, with good prospects. But for second-class steams, there is only a moderate inquiry, with rather lower prices. Steam smalls are unaltered at from 5s. to 5s. 6d. per ton, and second-class steams are 9s. to 10s. 3d., according to quality. In the gas coal trade, there is now felt the enlarging consumption that shows itself with the lengthening nights, and the deliveries are heavier on the large southern contracts. For best gas coals the quoted price is about 9s. 9d. to 10s. per ton f.o.b.; while for other kinds down to about 9s. per ton is asked. One contract for second class gas coals is said to have been booked for delivery over the whole of the next year, and 8s. 9d. is looked on as the price; but the exact figures are a little doubtful. Gas coke is irregular. The demand is fuller, but the output is now increasing. Prices may be said on the whole to be firmer, at last week's figures.

Scotch Coal Trade.

Sheriff Jameson, the Arbitrator in the matter of miners' wages, has decided that they are to be reduced the 6¼ per cent. which the coalmasters asked. This is the lowest point which the Conciliation Board can agree to. It is too early yet to say whether the reduction will have much effect on trade. There is a good volume of from day-to-day business; and coal for shipment is, if anything, in better demand. There is a ready sale for splint. The prices quoted are: Main 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow, ell 9s. 3d. to 10s. 3d., and splint 9s. 6d. to 9s. 9d. The shipments for the week amounted to 245,845 tons—an increase of 22,324 tons upon the previous week, and of 24,170 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 7,418,964 tons—an increase of 526,153 tons upon the same period of the previous year.

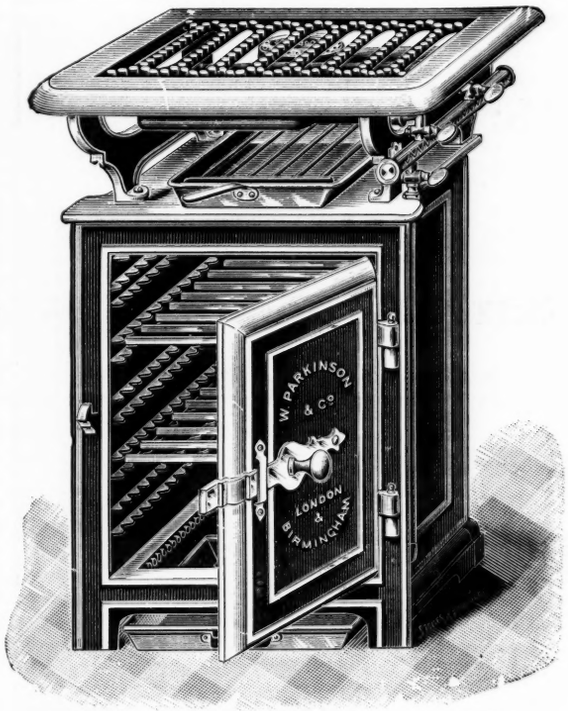
The Directors of the San Paulo Gas Company have decided to pay an interim dividend at the rate of 8 per cent. per annum, in respect of the half year ended June 30.

Accident at the South Shields Gas-Works.—An accident of a somewhat serious character occurred at the South Shields Gas-Works last Wednesday. While a man named John Smith, who was employed as engineman at the works, was oiling an engine, his clothing got caught, and he was dragged into the machinery, with the result that both his legs were badly injured.

Public Lighting of Newton Abbot.—It will be remembered that a short time since (*ante*, p. 418) the local Electric Light Company offered to light the streets of Newton Abbot much more efficiently than is at present done by means of gas at about the same cost—viz., £978 a year; but the Gas Company have now "gone one better." They say that they are prepared to reduce their charge for public lighting from 3s. 6d. to 2s. 10d. per 1000 cubic feet, and to provide and maintain 155 incandescent burners at the rate of 8s. per year each, as well as 123 ordinary burners at 1s. 3d. each. The Company also offer to do work which has hitherto been done by the Council. The total cost of the lighting under this estimate will be £699 a year, or £279 less than the price asked by the Electric Light Company.

Wide Tendering.—At the last meeting of the Margate Town Council, tenders were received for sinking a well and working shafts, and driving about 3200 yards of adit, at Wingham. The offer which was accepted by the Council—that of the Wingham Agricultural Implement Company, Limited—was for £9449; while the highest tender received was no less than £37,546. It was explained that the Engineer's original estimate for the work was £7700; and then there was an additional £1500 put on, making £9200 in all. Alderman Coleman, referring to the difference in the tendering, said the difficulty was the quantity of water to be pumped when driving the adits. The Wingham firm were used to well sinking, and they were in the district. Mr. Rolfe agreed that the difficulty was with regard to pumping, and said the allowance made for this accounted for the variation. They were told they might get 5 million gallons of water per day.

Gas Supply of Heaton and Frizinghall.—At a meeting of the Bradford Corporation Gas Committee last Friday, there was under consideration a communication from the Gas Committee of the Shipley District Council in respect to the purchase by Bradford of the right to supply gas in Heaton and Frizinghall, and the taking over of the mains in the district. It was resolved to recommend the Corporation to make the purchase for the sum of £31,000, subject to parliamentary powers being obtained. It may be remembered that efforts were made to get clauses inserted in the Bill recently promoted by the Shipley Council for the purchase of the Gas Company—in whose area Heaton and Frizinghall were included—to enable the Bradford Corporation to buy the rights of supply and the mains in those portions of the Company's area which lay within the city of Bradford. Difficulties were, however, raised by the Local Government Board, on the ground that the Shipley Council were not willing sellers; and it was to overcome this that the negotiations were entered into which have now ended so satisfactorily.



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STRONG IN MANUFACTURE.

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SIMPLE IN MECHANISM.

Quotations for Quantities on Application.

PARKINSON AND W. & B. COWAN, LTD.
(PARKINSON BRANCH),
LONDON & BIRMINGHAM.

Pinner Gas Company's New Holder.—The Pinner Gas Company have just completed a new holder of the capacity of 125,000 cubic feet, which has been erected by Messrs. C. & W. Walker, under the supervision of their London Manager, Mr. W. Chaffer. The holder is 80 feet diameter and 25 feet deep; arrangements having been made by which the depth can be increased to 50 feet. The ceremony of turning on the valve which allows the gas to pour into the holder was performed by Mrs. Bull, the wife of Mr. E. Bull, the Manager of the Gas Company, in the presence of a large assembly.

New Joint-Stock Company.—The New Inverted Incandescent Gas-Lamp, Limited, has been registered, with a capital of £125,000 in £1 shares, to adopt agreements (1) with the Inverted Incandescent Gas-Lamp Syndicate, Limited, (2) with the Sunlight and Safety Lamp Company, Limited, and (3) with James Bridger, for his appointment as General Manager, and to carry on the business of manufacturers of and dealers in lamps, lights, fittings, burners, and other apparatus for improving or increasing the illuminating or heating power of gas, oil, spirit, and other heat and light producing agents, and as manufacturers of and dealers in mantles, appliances, and chemicals.

Alleged Nuisance from a Gas-Works.—A report presented to the Bideford Town Council last week by the Sanitary Inspector referred to numerous complaints of the nuisance caused by gas lime at the gas-works. The Mayor (Mr. E. J. Tattersall) said it was a matter which ought to be taken serious notice of. On a former occasion, he was deluged with complaints from every part of the town. People were absolutely poisoned by the abominable stench which emanated from the gas-works every two or three weeks. Mr. T. Pollard asserted that the Company were throwing gas water down the sewers. Mr. S. Heard said the smells from the gas-works were often put down by visitors to the drains; and a most injurious impression was caused. It was decided that the Company should be communicated with, and directed to abate the nuisance.

Fatal Accident at the Brooklyn (N.Y.) Gas-Works.—According to the issue of the "American Gaslight Journal" just to hand, a serious accident has occurred at the Williamsburg station of the Brooklyn Union (N.Y.) Gas Company, which has resulted in the loss of five lives. The Company some time ago let a contract for the construction of a gasholder, to rest in a steel tank; the capacity of the vessel to be 5 million cubic feet. The holder was to be constructed on a plot of ground owned by the Company at North Twelfth Street and Wythe Avenue. Work on the tank had progressed to the point of the completion of the floor—the tank was 192 feet in diameter—and the task of lowering it to the foundation bed was under way. Everything was proceeding in the usual manner when, without much warning, the mass of metal shifted and dropped to the bottom, killing five of the workmen. At the time of the accident, the tank floor was at a height of 26 inches from the ground.

Gas Purchase Question at Rickmansworth.—A meeting of the ratepayers of Rickmansworth was held last Wednesday, to consider the proposal of the Urban District Council to buy the undertaking of the Rickmansworth Gas Company; the approval of a majority of the ratepayers being a condition precedent to the purchase. After considerable discussion, the resolution empowering the Council to promote a Bill in Parliament for the purchase of the undertaking as a going concern was passed with only three dissentients in a large and representative meeting. The Chairman of the Gas Company (Dr. R. W. Henderson) was present, and estimated the purchase price at £30,000, to which will have to be added 10 per cent. for compulsory purchase and the cost of the Company's recent Act, which will be considerable. Before the proceedings terminated, the Chairman of the District Council expressed the regret which they all felt at the news that Mr. Harvey Fellows, the Secretary of the Gas Company, was so ill as to leave little doubt that the end was near.

Driffield Gas Supply.—The Manager of the gas-works of the Driffield Urban District Council (Mr. Ernest W. Wright) has prepared a working statement for the year ended the 30th of June, from which it appears that certain economies are being effected, while at the same time there is a larger production of gas. The quantity of coal carbonized during the year was 2392 tons, which yielded 24,883,000 cubic feet of gas, compared with 2417 tons of coal, and a resulting production of 24,222,000 cubic feet of gas, in the previous year. There was more coal used in 1899-1900 (2500 tons), but the gas produced was less by more than a million cubic feet than in the past year. The gas sold to private consumers last year reached a total of 19,422,400 cubic feet, compared with 18,967,800 and 18,010,800 cubic feet respectively in the two preceding years. The quantity of gas unaccounted for, returned at 3,352,000 cubic feet last year, was greater by 500,000 cubic feet two years ago. Each ton of coal carbonized last year made 10,402 cubic feet of gas, against 10,021 cubic feet in the preceding year, and 9500 cubic feet in 1899. The leakage has been reduced from 14·25 per cent. in 1900 to 13·47 per cent. last year. The average illuminating power of the gas is 17·56 candles, compared with 16·88 candles in 1899-1900. There have also been large increases in the sale of tar and ammoniacal liquor. Penny-in-the slot meters have been introduced; but the total number of consumers does not augment to any extent. The statement, however, bears every indication of steady progress.

In the course of our notice last week of the recent extraordinary general meeting of the Airedale Gas Company, Idle, it was stated that Mr. Edwin Thornton had been associated with the undertaking for 33 years. Mr. Thornton, however, writes to say that he has been Secretary to the Company for over 43 years.

Messrs. John Wright and Co., of Birmingham, have just issued a pamphlet (of a suitable size for slipping into the pocket) containing illustrations and particulars of some of their well-known "Eureka" gas-fires and gas-heating stoves for the season 1902-3. Included in the number is a newly designed stove arranged for placing in an ordinary grate without fitting. It has been named the "E. R." It is very neat in appearance, besides being moderate in price.

HIRING GAS-FIRES.

Richmond's
Leading Patterns
are fitted
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Removable Bricks,

Removable Burners,

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Removable Swing Fronts

Eminently
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Hiring Out

Purposes.

Simplest in Construction

and

Cheapest to Maintain.

THE
RICHMOND
GAS STOVE AND METER CO., LTD.

The Glenboig Union Fire-Clay Company, Limited, earned a gross profit of £21,556 in the year ending Aug. 30 last. The Directors propose to write off £4000 for depreciation, to place £3000 to reserve, to pay a dividend of 10 per cent., and to carry £1066 forward.

The Mansfield Town Council intend to provide a new gasholder, at an estimated cost of £8000, in order to cope with the increasing demand for gas. Prepayment meters are rapidly growing in use in the town, £500 having recently been collected in one month.

The Crieff Gas Company are about to erect a new gasholder and boiler-house at their works, at a cost of about £5000. The contract for the holder has been let to Messrs. Henry Balfour and Co., Limited, of Leven. It is to be 80 feet in diameter and 20 feet deep; and the tank is to be of cast iron.

We have received from Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road, a copy of their new gas-fittings catalogue, No. 156. This list (which is supplementary to catalogue No. 119 issued last year, and in conjunction with which it should be used) contains the firm's latest patterns in fittings, globes, incandescent burners, mantles, &c.

The Bristol Water-Works Company have declared dividends for the half year to June 30 at the rate of 7½ per cent. per annum on the ordinary shares, and 5¼ per cent. per annum on the 7 per cent. maximum consolidated ordinary stock.

It was stated in yesterday's "Pall Mall Gazette" that some labourers, while excavating in the Borough High Street, near London Bridge, had discovered, a few feet beneath the surface, some wooden water-mains made by hollowing the trunks of large trees. Some were much decayed, while others were in an almost perfect state of preservation. It was, says our contemporary, in 1581 that the London Bridge Water-Works, the first enterprise of the kind in the kingdom, were started by Peter Morry, an enterprising Dutchman, who conceived the bold idea of forcing water from the Thames by pumping action derived from the tidal current, and distributing the supply so obtained by gravitation through wooden pipes. One water-wheel was placed under an arch of London Bridge; and this proving successful, another was added. There may, it is remarked, be some difficulty in fixing the precise age of the relics just unearthed; for it was only as comparatively recently as 1810 that the use of iron water-pipes, first introduced by the Chelsea Company in 1746, became general in London.

WANTED, FOR SALE, AND CONTRACT ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

ASSISTANT-ENGINEER. Wrexham and E. Denbigh Water Company. Sept. 27.
ENGINEER AND MANAGER. Ilford Gas Company. Oct. 11.
GENERAL FOREMAN. Midland District. No. 3914.
LAMP SUPERINTENDENT. Newcastle Gas Company. Oct. 3.
MANAGER AND SECRETARY. Glastonbury Gas-Works. Sept. 29.
NIGHT FOREMAN. Tunbridge Wells Gas Works.
WATER ENGINEER AND SURVEYOR. Portland, Oct. 6.
WORKING MANAGER. Beccles Gas Company.

SITUATIONS WANTED.

FITTER (Gas or Water). No. 3915.
GAS-STOVE REPRESENTATIVE. Richmond, Handsworth.

GAS MANUFACTURE AND ANALYSIS CLASSES.

BATTERSEA POLYTECHNIC.

PLANT, &c. (Second-Hand), FOR SALE.

EXHAUSTER AND GASHOLDERS (various). Wright, London.
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PURIFIERS. Mablethorpe Gas-Works.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, &c. Firth Blakeley, Dewsbury.

PUPIL.

LARGE GAS AND WATER WORKS. No. 3911.

SALES OF STOCK.

NEWCASTLE AND GATESHEAD WATER COMPANY. Oct. 14.
PORTSMOUTH WATER COMPANY. Oct. 9.
READING GAS COMPANY. Oct. 9.

TENDERS FOR

COKE.

PINNER Gas Company.
RAMSGATE CORPORATION. Tenders by Sept. 29.

GASHOLDER AND TANK.

GUERNSEY GAS COMPANY.

TAR.

WALLASEY GAS DEPARTMENT. 2500 tons. Tenders by Sept. 30.

VIADUCT.

SOUTHEND GAS COMPANY.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

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O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
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J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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CHARLES E. FRY, Leamington; and at Tower Chambers, Brown Street, MANCHESTER.
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General Manager (for Scotland)—
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MARK DUFFIELD & SONS (Estab- lished 200 Years), makers of Street and Shop Lamps to own Pattern and Design. Any description of Lamp made. Inquiries invited.
London Manager: EDWARD PADFIELD, West India House, 96 & 98, LEADENHALL STREET, E.C.
Telegraphic Address: "EUPATHY, LONDON."

COAL GAS TAR wanted.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE Cement, Paint, Mains, Tubes
STREET LANTERNS, GLASS, TOOLS, &c.
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5, CROOKED LANE, CANNON STREET,
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AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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FOR GAS PURIFICATION.
THE DUNSTABLE LIME COMPANY,
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Calcium Oxide (Quick Lime) . .	98·9
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TO GAS AND WATER OFFICIALS.

HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

IT is worth your while to buy direct. THE RELIANCE LUBRICATING OIL COMPANY 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Subastral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

PROVINCIAL Gas Companies may profitably consider the advantages offered by ACETYLENE for the PUBLIC and PRIVATE LIGHTING of OUTLYING PORTIONS OF THEIR DISTRICTS, which do not at present justify the expense of laying Coal-Gas Mains from the Central Works.
Correspondence on this subject is invited by the ACETYLENE ILLUMINATING COMPANY, LIMITED, 3, Victoria Street, LONDON, S.W.

TO GAS AND WATER OFFICIALS.

HIGHEST Grade Cycles, "Premiers," "Court Royals," "Triumphs," "Humbers," "Swifts," "Centaurs," and all best and choicest Coventry Manufactures on SPECIAL TERMS to GAS and WATER OFFICIALS. Agents Wanted.
Apply to the MANAGER, Imperial Cycle Supply Company, COVENTRY.

WANTED, re-engagement as Fitter for either Gas or Water. Practical knowledge of all kinds of Lead and Iron Pipe work. Understands Pumping. Served Seven Years' Apprenticeship as Plumber. Willing to work. Abstainer. Age 28. Good References.
Address No. 3915, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FRANK H. RICHMOND (brother of the late E. W. T. Richmond) is now open to REPRESENT a GAS-STOVE MANUFACTURER. First-class Salesman, good Address, and excellent References as to Ability and Character.
Address 64, Arden Road, Handsworth, BIRMINGHAM.

ILFORD GAS COMPANY.

ENGINEER AND GAS MANAGER.

THE Directors of the above Company require the services of an experienced Man (technically educated) as ENGINEER and GAS MANAGER. Present make about 180 million cubic feet per annum.
The person to be appointed must have a thorough knowledge of Gas-Making in all its branches, the Testing of Coal and Products, and the Treatment of Residuals. He must have a good knowledge of Engineering and Chemistry, and have had experience in the Design and Construction of modern and up-to-date Gas-Works Plant, and also be experienced in the practical working of Inclined Retorts and Water-Gas Plant.
An Assistant Manager resides on the Works.
The Salary will be £400 per annum (no house or extras).
Particulars of the Duties and Conditions of Appointment may be had on application to the undersigned.
Applications, stating Age, Experience, and when prepared to take up Duties, together with *copies* of not more than Three recent Testimonials, to be sent to me, on or before Saturday, Oct. 11, endorsed "Application."
Canvassing will disqualify.
By order,
H. W. ASHMOLE,
Secretary.
Ilford, Sept. 16, 1902.

MARRIAGE—PATERNOSTER-DRIVER.

ON Sept. 16, at St. Andrew's Church, Great Finborough, Stowmarket, by the Rev. Housecroft, Francis Mark Paternoster, Gas Engineer, Felixstowe, eldest son of the late Robert Frederick Paternoster, of Ipswich, to Isabel, second daughter of Mr. J. B. Driver, Great Finborough.

PUPIL.

THE Engineer and Manager of a large Gas and Water Works has a vacancy on his Staff for a PUPIL. Premium.
Apply, by letter, to No. 3911, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a Small Country Works making 2 million cubic feet. House provided on the Works, with Coal and Gas.
Apply, by letter, stating Wages required, to
W. METHVEN,
Engineer and Manager.
Gas-Works, Beccles.

GENERAL Foreman Wanted, under Superintendent at a large Gas-Works in the Midlands, to live on the Works (at a rental). Must be experienced in modern methods of Carbonization and Purification, and with up-to-date Gas-Works Plant and Machinery, including Carburetted Water-Gas Plant. Mechanical training preferred.
Wages to commence at £3 5s. per week.
For further Particulars, apply by letter, stating Age, Qualifications, and References, &c., to No. 3914, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Newcastle-upon-Tyne and Gateshead Gas Company require a SUPERINTENDENT for their Public Lamp Department. Applicants must have had previous experience.
Applications to be made, on or before the 3rd of October, in Candidate's own Writing, stating Age, Salary required, and giving Particulars of Experience, with *copies* of recent Testimonials, to
THOS. WADDOM,
Secretary.
35, Grainger Street West,
Newcastle-upon-Tyne.

GLASTONBURY CORPORATION GAS-WORKS.

WANTED, an experienced Man as MANAGER, to take charge of the Works, District, and Accounts, and to act as SECRETARY to the Gas Committee.
Present annual make of Gas 25 millions. Commencing Salary £160, rising £10 annually to £200.
Applications to be in own handwriting, with Age and Experience, and *copies* of not more than Three recent Testimonials, and to be sent in on or before Sept. 29, addressed Gas Committee, Glastonbury, and marked "Application."

TUNBRIDGE WELLS GAS COMPANY.

NIGHT FOREMAN.

WANTED, an active, trustworthy Man, who is a good Carbonizer and thoroughly understands the working of Regenerative Settings, Stoking Machinery, &c.
Applications, stating Age, Experience, and Salary required, together with *copies* of recent Testimonials, to be sent to
ANDREW DOUGALL,
Engineer and General Manager.
Gas-Works, Tunbridge Wells,
Sept. 12, 1902.

THE Wrexham and East Denbighshire Water Company require the services of an ASSISTANT ENGINEER, having experience of Reservoir Construction. Preference will be given to one having a practical knowledge of Levelling and Surveying, and capable of preparing Working Drawings, Estimates, &c. Salary £3 3s. per week.
Applications, stating Age, present and previous Occupations, together with *copies* of not more than Three recent Testimonials, to be sent to the undersigned not later than Sept. 27.
FREDERICK STORR,
Engineer.
Water Company's Offices,
Egerton Street, Wrexham.

URBAN DISTRICT COUNCIL OF PORTLAND.

APPOINTMENT OF WATER-WORKS ENGINEER AND SURVEYOR.

THE Urban District Council of Portland invite applications for the post of WATER-WORKS ENGINEER and SURVEYOR, at a Salary of £200 per annum.
The person appointed will have charge of the Council's Water-Works, and will be required to perform all the duties usually performed by a Surveyor to an Urban Authority, including the control of Workmen, the Payment of Wages, and Keeping of Wages Accounts in the manner required by the Local Government Board, and also the Inspection of Buildings in course of erection.
The person appointed must devote his whole time to the Duties of his Office.
Applications, stating Age, Experience, and Qualifications, and accompanied by *copies* of not more than three Testimonials, to be sent to me by Twelve o'clock on Monday, the 6th day of October next, marked "Water-Works Engineer and Surveyor."
Canvassing Councillors, either directly or indirectly, will be a disqualification.
J. HOWARD BOWEN,
Clerk to the Council.
Council Offices, Portland,
Sept. 15, 1902.

FOR SALE—Two 5 ft. square Purifiers, Four Layers Wood Grids, two 4-inch Four-Way Valves, and 4-inch Connections. In good working order. Tenders invited.
Apply to the GAS-WORKS, MABLETHORPE, S.O.

GAS OIL for Carburetting Water Gas. Same as supplied to several important Gas Undertakings.
Inquiry invited by W. H. HARVEY, 27, Leadenhall Street, LONDON, E.C.

CANTERBURY GAS AND WATER COMPANY.

FOR SALE—110 Lamp Columns, with Cages complete; and 70 LANTERNS.
All in good Condition, and may be seen on application to, or further Particulars obtained of, H. C. PAGE, Engineer, Gas-Works, CANTERBURY.
Sept. 9, 1902.

TO BE SOLD—
EXHAUSTING PLANT, complete with Engine and Boiler, for 3000 to 4000 feet per hour.
GASHOLDER, 16 ft. by 10 ft. with 4 Columns.
GASHOLDER, 20 ft. by 10 ft. with 4 Columns and Suspension.
GASHOLDER, 45 ft. by 14 ft. with 5 Columns and Two Lift.
Write J. WRIGHT, 181, Queen Victoria Street, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—
200 SELF-SEALING MOUTHPIECES, Tangyes' Pattern, 15 in. by 13 in. O.
72 SELF-SEALING MOUTHPIECES, C. & W. Walker's, 15 in. by 13 in. O.
5 inch ASCENSION-PIPES, BENDS, BRIDGE and DIP PIPES, STEEL HYDRAULIC MAIN, 18 in. by 13 in. O., with Cast-Iron Covers, Regulating Seal Valves, Buckstays, Hydraulic Main Cradles, Tie-Rods, &c.
Further Particulars can be obtained on application at the Gas-Works, Dock Street, Dundee.
Tenders to be lodged with the undersigned not later than Monday, the 29th of September.
THOS. THORNTON,
Clerk of the Commissioners.
City Chambers, Dundee,
Sept. 16, 1902.

RAMSGATE CORPORATION.

(GAS DEPARTMENT.)

THE Committee invite Tenders for the purchase of their surplus COKE from the 1st of October, 1902, to the 30th of September, 1903. Probable quantity 2000 to 3000 Tons, delivered free on rail, or free into barge, purchaser paying dues.
Tenders to be sent in not later than 10 a.m. on Monday, the 29th inst., addressed to the Chairman of the Gas Committee, Boundary Road, Ramsgate, and endorsed "Tender for Coke."
The Committee do not bind themselves to accept the highest or any Tender.
WILLIAM A. VALON,
Engineer.

SOUTHEND GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the supply and erection of a VIADUCT commencing at their Gas-Works to and along the Foreshore, to be constructed of Steel Girders and Cast-Iron Columns, &c., with Wood Decking and Steel Tram Rails complete.
Drawings may be seen, and Specification obtained, by payment of One-and-a-Half Guineas, which will be returned upon the receipt of a *bonâ fide* Tender, and all Particulars may be had from the Engineer at the Gas-Works, Southend-on-Sea.
The Contractor will be required to enter into a Bond with approved sureties for the due performance of the Contract.
The Directors do not bind themselves to accept the lowest or any Tender.
By order,
JAS. T. RANDALL,
Secretary.
Offices: 52B, High Street,
Southend-on-Sea, Sept. 10, 1902.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS, WATER, AND ELECTRICITY DEPARTMENT.)

TO TAR DISTILLERS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the purchase of the surplus GAS TAR (about 2500 Tons) produced at their Gas-Works, Great Float, near Birkenhead, during a period of One or more Years from the 30th inst.
A Pipe is laid from the Gas-Works to the Great Float for conveying the Tar into the Contractor's Boats, and the Council will, if necessary, provide Appliances on their own Siding to Pump the Product direct into the Contractor's Railway Tank-Waggons.
Any further Information may be obtained on application to the Engineer, Mr. J. H. Crowther, at his Office at the Works.
Sealed Tenders, addressed to the undersigned, and endorsed "Tender for Tar," to be delivered per post, at my Office as below not later than Tuesday, the 30th inst.
By order,
H. W. COOK,
Clerk to the Council.
Public Offices, Egremont,
Cheshire. Sept. 19, 1902.